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TRANSACTIONS

OF THE

ROYAL ACADEMY OF MEDICINE IN IRELAND.

TRANSACTIONS

OF THE

Royal Academy of Medicine

IN IRELAND.

VOL. XVII.

EDITED BY

JOHN B. STORY, M.B., F.R.C.S.,

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KING'S COLLEGE HOSPITAL
MEDICAL SCHOOL



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[The figures prefixed denote the date of election. The figures appended to Names denote the number of Communications. Original Fellows are marked †.]

- 1893 ALLWORTHY, S. W., M.D., F.R.C.S., Assistant Physician Hospital for Diseases of the Skin, The Manor House, Antrim-road, Belfast.
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1884 YOURELL, M. J., M.R.C.P., 26 Merrion-square, N., Dublin.

MEMBERS.

1892 BARKER, WM. OLIVER, L.A.H., Resident Medical Officer Grand Canal-street Dispensary, Dublin.

+ BOYCE, JOS. W., M.B., Medical Officer Blackrock Dispensary District, Glenart-avenue, Blackrock, Co. Dublin.

1897 BOYD, ALFRED E., M.B., 53 Harcourt-street, Dublin.

1897 BURNES, RUDOLPH A. C., M.B., B.Ch., Dub., 1 St. John's-terrace, N. C. Road.

1887 COPE, GEO. PATRICK, L.R.C.P., L.R.C.S., late Assistant Resident Medical Superintendent Richmond District Lunatic Asylum, Medical Officer No. 3 Dispensary District, South Dublin Union, 43 Harrington-street.

1892 DAY, J. MARSHALL, M.B. Univ. Dublin, Resident Medical Officer Cork-street Fever Hospital, Dublin.

+ DELAHAYDE, J. O'CONNELL, L.R.C.S., Medical Officer No. 2 District North Dublin Union, 47 Rutland-square, Dublin.

1891 ELLIOTT, W. S., M.B., B.Ch., Medical Officer of Constabulary, Malahide, Co. Dublin.

1894 EUSTACE, H. M., M.D., B.Ch. Univ. Dublin, Asst. Physician Highfield Private Lunatic Asylum, Highfield, Drumcondra.

1897 FLEURY, ELEONORE LILIAN, M.D., R.U.I., Richmond District Asylum, Dublin.

1894 FLOOD, FREDERICK L., L.R.C.P., L.R.C.S., Collegues, Booterstown, Co. Dublin.

1889 GOULDING, H. BENSON, L.R.C.P., Edin. F.R.C.S., 16 Rathmines-road.

1897 GROGAN, GERTRUDE, M.B., B.Ch., R.U.I., District Asylum, Mullingar.

1894 HANRAHAN, E. F., M.B., B.Ch., R.U.I., Resident Medical Officer, 37 Castle-street, High-street, Dublin.

1898 HATCH, RICHARD, L.R.C.P. & S., 166 Pembroke-road.

1897 HUGHES, CHARLES, L.R.C.P. & S.I., 27 Westland-row.

1898 LLOYD, H. C., M.B., M.Ch., Edin., Assistant Master Rotunda Hospital.

1883 M'DERMOTT, P. A., F.R.C.S., Mount Clarence, Kingstown.

1892 M'GRATH, JAMES JOSEPH, L.R.C.S., L.A.H., 73 Lower Mount-street.

1891 MAGUIRE, KATHARINE M. N., M.B., B.Ch., 67 Merrion-square, South, Dublin.

MELDON, GEORGE P., L.R.C.P. & S., 15 Merrion-square.

1895 RAMSBOTTOM, ALFRED E. W., L.R.C.P., F.R.C.S., Box 51, Johannesburg, South Africa. [*Resigned.*]

- 1898 REDINGTON, JOHN, L.R.C.P. & S., Richmond Asylum.
 1885 RIDLEY, GEORGE P., L.R.C.S., L.R.C.P., Surgeon King's County
 Infirmary, Tullamore, King's County.
 1885 SHAW, JAMES, L.R.C.S., 93 Talbot-street, Dublin.
 † SPEEDY, ALBERT O., L.R.C.P. Ed., Medical Officer No. 3 Dispensary
 District, North Dublin Union, 23 North Frederick-street, Dublin.
 1884 STRAHAN, MICHAEL, L.R.C.S., Medical Officer No. 2 North City
 Dispensary District, 38 Rutland-square, Dublin.
 1895 TURNER, DAVID, L.R.C.P. & S., late Resident Medical Officer Royal
 Hospital for Incurables, 68 Grosvenor-road, Rathmines.
 1896 WAYLAND, R. S., L.R.C.P. & S., 54 South Richmond-street, Dublin.
 1887 WYNNE, GEO. NESBITT, M.D., M.Ch., 31 Harcourt-street, Dublin.

STUDENT ASSOCIATES.

- BYRNE, JOSEPH P., 23 South Richmond-street.
 CLUTTERBUCK, LIEUT.-COL., 7 Lower Pembroke-street.
 CRAWFORD, JOHN MAGNAW, 113 Donore-terrace, S.C.R.
 DONELAN, THOS. O'CONOR, Mater Misericordiæ Hospital.
 DREAPER, FRANCES, School of Medicine, Cecilia-street.
 ENGLISH, ADELINE, School of Medicine, Cecilia-street.
 FORDE, MICHAEL, Medical School, Cecilia street.
 HAMILTON, J. BALL, 5 Churchill-terrace, Sandymount.
 HARPER, ISABEL WANTYN, 3 Belgrove-villas, Clontarf.
 HENNESSY, MRS., Aylesford, Ballsbridge.
 HOUSTON, WM., 15 Grantham-street.
 KELLY, WM. D., 6 Raglan-road.
 KNOX, E. B., 2 Milward-terrace, Bray.
 LITTLE, GEORGE, Richmond Hospital.
 LYNN, KATHLEEN, Medical School, Cecilia street.
 MARKS, EDITH, 16 Granby-row.
 MASSY, EVERNIA, Medical School, Cecilia-street.
 O'FARRELL, LEWIS MORE, M.D., 9 Lower Leeson-street.
 O'CONNELL, JOHN, School of Medicine, Cecilia-street.
 SCARLETT, HON. ELLA, 16 Granby-row.
 SPAIGHT, HENRY, Meath Hospital.
 STEWART, PERCY, 8 Ely-place.

RULES.

1. The name shall be, "ROYAL ACADEMY OF MEDICINE IN IRELAND." (1887.)

Constitution.

2. The Academy shall consist of Fellows, Honorary Fellows, Members, and Student Associates.

Management.

3. The affairs shall be managed by a Council, consisting of the President, Ex-Presidents (1893), the six Presidents of Sections, the General Secretary and Treasurer, the Secretary for Foreign Correspondence, six Secretaries of Sections, and eight Councillors, being two representatives from the Medical, Surgical, Obstetrical, and Pathological Sectional Councils respectively.

Meetings.

4. The Meetings shall be General and Ordinary.

Publication of "Transactions."

5. The "Transactions" shall be published by the Council, subject to the provisions hereinafter contained.

Original Fellows and Members.

6. All the Members of the present Societies (Medical, Surgical, Obstetrical, and Pathological) shall be Original Fellows or Members, without entrance fee, on payment of the annual subscription on or before 31st December, 1882.^a

Fellows.

7. Fellows of the Royal College of Physicians of Ireland, and of the Royal College of Surgeons in Ireland, shall be admitted, without ballot, on payment of the entrance fee and the subscription for the current year. All others, being Registered Medical Practitioners not directly or indirectly engaged in the sale of drugs, shall be proposed by two Fellows, and elected by ballot by the Council.

8. Candidates shall be proposed at one Meeting of the Council, and balloted for at the next—one black bean in four to reject.

- 8A. That all Rules referring to the admission of Fellows, Members, and Student Associates shall be interpreted as referring to Ladies as well as Gentlemen.

Privileges of Fellows.

9. Fellows only shall be eligible for office in the Academy. They shall have the privilege of attending all Meetings of the Academy, of making Communications, and of voting and speaking at such meetings. They shall also receive a copy of the "Transactions."

^a Those who have paid a Life Subscription to any of the above Societies will be admitted to the privilege of Fellows on payment of Member's subscription.

10. These privileges shall not be exercised by any Fellow in arrear with his subscription.

Honorary Fellows.

11. Honorary Fellows, limited in number to 25, may be nominated by the Council, and elected, on motion at a General Meeting of the Academy by a majority of at least two-thirds of those present and voting.

Members.

12. Any Registered Medical Practitioner may be elected as a Member, the election to be conducted in the same manner as that of Fellows.

Privileges of Members.

13. Members shall have the privilege of attending the Ordinary Meetings of the Academy, of making Communications, and of taking part in debate. They can purchase the "Transactions" at cost price.

Student Associates.

14. Registered Medical Students may be elected Student Associates for the period of one year. The Subscription must be paid before election, and the Council may elect without notice of motion.

15. Student Associates shall have the privilege of attending the Ordinary Meetings of the Academy.

Annual Subscription.

16. Fellows shall pay £2 2s., and Members £1 1s. Student Associates shall pay 5s. The Subscription shall become due on the 1st of October in each year, and if the Subscription be not paid on or before the first Meeting in February, the defaulter shall cease to belong to the Academy, unless the delay shall be accounted for to the satisfaction of the Council. No Fellow shall vote at the Annual General Meeting who has not paid his subscription for the year. Medical Officers of the Army and Navy, and Registered Medical Practitioners not residing within 15 miles of Dublin, are eligible as Fellows of the Academy on payment of the entrance fee, and an annual Subscription of £1 1s.

Entrance Fee.

17. After admission of Original Fellows, all Fellows shall pay an entrance fee of £1 1s.

Council.

18. The Council shall meet on the first Wednesday in the month throughout the Session, or oftener should they see occasion—five to form a quorum.

19. Notice of all Extraordinary Meetings shall be transmitted by the Secretary to every Member of the Council. The President or any five Members of Council may call an Extraordinary Meeting of the Council. The Council shall determine questions by vote, or by division if so demanded, the President having a casting vote only. Any regulation of the Council shall have the force of a law, until submitted to the next General Meeting. The Council shall have the power of filling up any vacancies which may occur in the list of Officers of the Academy, except that of President, before the Annual General Meeting. If a vacancy in the office of President should occur, the General Council shall summon a Special General Meeting of the Academy to fill such vacancy. (1888.)

Sectional Councils.

20. There shall be six Sectional Councils elected by the Annual General Meeting in October, termed respectively—the Medical, the Surgical, the Obstetrical, and the Pathological, the State Medicine, and the Anatomical and Physiological Councils.

21. No Fellow shall be eligible as a candidate for election on more than two Sectional Councils, but no Fellow shall be eligible as a candidate for election on both the Medical and Surgical Sectional Councils. (1888.)

22. Each Sectional Council shall consist of the President of the Section and ten Members, one of whom shall act as Secretary to the Section ; except the State Medicine and Anatomical and Physiological Councils, which shall each consist of a President and six Members. (1888.)

Meetings of Sectional Councils.

23. Each Sectional Council shall meet on a fixed day at least one week before the Ordinary Meeting of their Section, three to form a quorum.

Powers.

24. Each Sectional Council shall have the power of making any such arrangements as it thinks necessary to carry on the work of the Ordinary Meetings which are under its charge, provided that such arrangements do not interfere with the general laws of the Academy ; and any Rules laid down by such Council shall have the force of laws at the Ordinary Meetings under its charge, until submitted to the General Council.

25. Each Sectional Council shall have the power of filling up any vacancies that may occur among its Members until the Annual General Meeting.

Committee of Reference.

26. The Council shall appoint a Committee of Reference, to report upon morbid growths and other specimens exhibited before the Academy ; of this Committee the Exhibitor shall, for the occasion, be a Member.

Officers.

27. A President, to be elected by the Annual General Meeting in October, and to hold office for three years.

28. The Presidents of the Colleges of Physicians and Surgeons for the time being shall be the Presidents of the Medical and Surgical Sections. The Presidents of the other Sections shall be elected by the Fellows at the Annual General Meeting, and shall hold office for two years. (1888.)

29. One General Secretary and Treasurer to be elected at the Annual General Meeting.

30. It is expedient that a fixed salary (of one hundred guineas) shall be paid yearly to the General Secretary in consideration of the fact that the editing of the "Transactions" is part of his duties.

31. One Honorary Secretary for Foreign Correspondence to be elected at the Annual General Meeting. (1888.)

32. The Councillors for each Section to be elected at the Annual General Meeting. Each Sectional Council shall elect two Members to act on the

General Council, except in the case of the Sections of State Medicine and Anatomy and Physiology. (1888)

33. Two Members in each Sectional Council shall retire annually, and be ineligible for re-election for one year, except in the Council of the Section of Anatomy and Physiology, in which only one shall retire (Oct., 1896).

34. Six Secretaries, one for each Section, to be appointed by the Sectional Councils.

35. At all elections after the year 1882, any Fellow desirous of nominating a candidate for election shall, at least one fortnight before the Annual General Meeting, forward an application to the General Secretary to enter the name of such Fellow on the list of candidates for office, provided that the Fellow so nominated shall have consented to act. (1891.)

36. That all elections shall be by ballot, but Fellows residing more than 15 miles from Dublin, and those incapacitated from attending by illness (to be certified), may record their votes by ballot papers, sent to the presiding officer in sealed envelopes provided for that purpose (Oct., 1896).

37. That in all elections to the Sectional Councils there shall be affixed to the name of each candidate the number of meetings of that particular Section for the Council for which he is now a candidate that he has attended. (1893.)

Duties of Officers.

38. *The President* shall preside at the Annual and Special General Meetings and at General Council Meetings. In the absence of the President, the Chairman shall be appointed by the meeting. (1888.)

39. *The Presidents of Sections* shall preside at the Ordinary Meetings of the Academy, and shall also preside at the Sectional Council Meetings. In the absence of the President, the Chairman shall be appointed by the meeting. (1888).

40. *The General Secretary* shall attend all General Meetings of the Academy and General Council. He shall take minutes of such meetings, to be read at the following meeting.

41. He shall receive and have charge of all papers intended for publication in the "Transactions" of the Academy, after they have been handed over to him by the Secretaries of the several Sections.

42. He shall, on receiving notice from the Secretary of a Section, send out to all the Members notices of the title or titles of the paper or papers for the next Ordinary Meeting, with the name or names of the authors, and, so far as possible, of the subjects for Exhibition, with the names of the Exhibitors.

43. He shall arrange for the Exhibition of specimens and the reading of papers, which are forwarded to the Academy by those who are absent, or are not members.

44. The General Secretary and Treasurer shall receive all moneys, and lodge the same in bank to the account of the Academy, and all cheques shall be signed by the Treasurer and one other Councillor.

45. The Accounts shall be audited by two Fellows, not Members of Council, to be appointed by the President at some meeting previous to the Annual Meeting.

Duties of Secretaries of Sections.

46. To attend the Meetings of the Council of the Section and the Ordinary Meetings of the Academy, under the management of said Council, and to take minutes at such meetings, to be read at the next following meeting of that Section.

47. To keep such papers as the Sectional Councils deem worthy of publication, for the purpose of handing them over to the General Secretary.

48. To inform the Secretary of the Committee of Reference of any specimens referred to that Committee, and to transfer the specimens to that Secretary.

49. To give notice to the General Secretary, one week previously to the meeting, of the titles of papers for the evening, the names of the authors, and, so far as possible, the objects for Exhibition, with the names of Exhibitors, so that the General Secretary may inform the Members.

Meetings.

50. The Annual General Meeting to take place on the last Friday in October, for the election of Officers and Members of Council, and for the general business of the Academy.

51. Due notice of the meeting shall be given by the Secretary to all Members at least three weeks previously. (1891.)

52. No motion involving a change of these Rules shall be brought before this meeting except one week's notice thereof shall have been given by the Secretary to each Member.

53. The President may—and shall forthwith, on receiving a requisition signed by seven Fellows, at any time—on giving one week's notice, summon a Special General Meeting, for the consideration of particular business, the nature of which must be specified in the letter of summons convening the meeting, and at such meeting no other business can be transacted. In the event of the President being unable, from any cause, or declining, to summon a Special General Meeting of the Academy, it shall be in the power of the General Council to summon such meeting. (1888.)

Ordinary Meetings.

54. The communications to be submitted to the Ordinary Meetings shall be grouped under the following heads :—Medicine, Surgery, Pathology, Obstetrics, State Medicine, and Anatomy and Physiology ; and the conduct of such meetings shall be in the hands of the several Sectional Councils, each Sectional Council to have the management of the Ordinary Meeting in rotation, as arranged by the General Council. (1888.)

55. The Ordinary Meetings shall be held on every Friday evening, from the first Friday in November until the last Friday in May, inclusive, at eight o'clock, except during the Christmas and Easter recesses.

56. All Fellows, Members, and Student Associates attending the meetings, shall write their names in the attendance book.

57. Any Fellow or Member may introduce two Visitors by cards obtained from the Sectional Secretaries.

58. Officers of the Army or Navy Medical Departments shall, on presenting their cards, be admitted to the Ordinary Meetings of the Academy.

59. No communication shall exceed twenty minutes in its delivery, nor any speech thereon ten minutes, except by permission of the Chairman. No one shall speak twice upon the same communication, except the author, who has the right of reply.

60. A paper by any other than a Fellow or Member of the Academy shall not be read before the Academy unless the author of such a communication shall have obtained permission to do so from the Council of the Section before which the communication is proposed to be read. (1892.)

Ordinary Meetings.—Order of Business.

61. (1.) Chair to be taken at 8 30 p.m.
- (2.) Chairman to read list of specimens, &c., exhibited by card, together with the names of the Exhibitors.
- (3.) No Pathological Specimen shall be exhibited at any Section other than the Pathological and Obstetrical, except by card. This Exhibition shall not exclude any subsequent communication regarding it at the Pathological Section.
- (4.) There shall be no Exhibition of Specimens by card in the Obstetrical or Pathological Sections.
- (5.) Any member shall have liberty to exhibit any recent specimen at any of the meetings of the Obstetrical Section, provided it illustrates any question in gynecology.
- (6.) At the meetings of the Obstetrical Section recent specimens may be exhibited, and the President shall invite discussion thereon, provided that such exhibition of specimens or discussion, if any, thereon, must terminate at 9 o'clock, p.m., but that, if necessary, they may be resumed after the papers for the evening have been read and discussed.
- (7.) Chairman to ask if any member has any observations to make or motion to propose relative to any living specimen on the List of Exhibition.
- (8.) Chairman to call upon the author of the first paper on the list to read his paper.
- (9.) Chairman to call upon members to discuss the paper, or, at his discretion, to take any other paper or papers on the list relating to the subject, and have the discussion subsequently on all such papers collectively.
- (10.) When the last paper has been discussed, the Chairman to ask if any member desires to speak upon any of the specimens exhibited by card.
- (11.) After the discussion upon any specimen, the Exhibitor has the right of reply.

Regulations regarding the Exhibition of Specimens by Card.

62. (1.) Any member may exhibit by card at any Ordinary Meeting, except at the meeting of the Pathological and Obstetrical Sections. At the meetings of the Pathological all specimens must be presented and described *viva voce*, and debate may be invited thereon.

- (2.) Notice shall, if possible, be given to the General Secretary, or the Secretary of the Section, on or before the previous Ordinary Meeting.
- (3.) Specimens must be in the room at 7 45 on the night of Exhibition.
- (4.) Specimens for Exhibition by card shall be open for inspection at 8 p.m.
- (5.) A card, containing all particulars for publication, shall be placed with the Specimen. Cards for this purpose are to be obtained from the Secretary.
- (6.) The Exhibitor should be present, and he shall furnish further details if asked for.
- (7.) Every Exhibitor shall submit the Specimen or Specimens on view to the Committee of Reference, if the meeting so decide.

Exhibition of Pathological Specimens.

63. No lengthened reference to treatment shall be allowed upon any Specimen, except by the express permission of the Chairman. Whenever it has been agreed that a Specimen exhibited at a Sectional Meeting of the Royal Academy of Medicine in Ireland shall be sent to the Reference Committee to report thereon as to its nature, the Exhibitor is to retain the custody of the specimen until he shall be summoned to a meeting of said Committee to be convened by its Secretary, on an early day, when he will attend and submit it for examination. (1889).

By-laws concerning "Transactions."

64. The "Transactions" shall consist of such Communications made to the Academy by or through Fellows or Members as may be deemed by the General Council suitable for publication; also, of discussions of importance or interest arising out of such Communications.

65. All Communications accepted by the Academy become the property of the Academy, but authors may also print their Communications, subsequent to the reading of the same before the Academy, in any publication in addition to the "Transactions." Papers shall be handed to the Secretary of the Section immediately after they have been read. (1891.)

66. The "Transactions" for the year shall be presented to all Fellows of the Academy who have paid their Annual Subscriptions.

67. The "Transactions" may be purchased by Members at cost price.

68. The Publication Committee of each Section shall meet not later than the Tuesday after each meeting of the Section, for the purpose of abstracting the proceedings—the abstract to be placed in the printer's hands on same evening, and forwarded to the editors of medical journals with the least possible delay. (1888.)

69. Contributors of papers are requested to send their papers to the Academy printer early enough to allow of their being put in type before the meeting, and read in proof. (1888.)

70. That on the evening of the day of meeting of the Sectional Council, when the papers for the next meeting have been decided upon, a circular be sent to each contributor informing him :—

- (1.) That he is expected to be ready or else take his place at the bottom of the list.
- (2.) That he must have an abstract ready with his paper, otherwise he will be noted in the published proceedings in such form as the Publication Committee think fit.

71. The General Council is empowered to defray the expenses in whole or in part of any illustrations which it may consider advantageous to the elucidation of the papers published by the Academy.

72. An abstract (prepared by the author) of each communication made at the Academy, along with a report of the discussions thereon, shall be furnished to the editors of such medical journals as may desire to publish them, and the authors of such communications shall be empowered to publish their papers *in extenso* in any periodical or periodicals they may think fit, such communications also to appear in the "Transactions," provided the Council consider them worthy of insertion.

Expulsion of Fellow or Member.

73. Expulsion of a Fellow or Member can take place only at a General Meeting of the Academy, on the motion of the Council, if two-thirds of the Members present shall vote for the same by ballot. Of such ballot the Council must give at least fourteen days' notice in writing to every Fellow of the Academy.

New Laws.

74. New Laws, or alterations in existing Laws, can be proposed only at the Annual General Meeting. Any Fellow proposing such alteration shall give notice to the General Secretary at least ten days before the General Meeting in October.

REPORT.

THE General Council begs to report that the number of Fellows for the Session 1897-8 was 235; of Members, 29; of Student Associates, 17. The Fellows decreased by 11, the Members by 7, and the Student Associates increased by 12.

A Congress was held in Dublin in the month of August by the Royal Institute of Public Health. This Congress was largely attended by the Fellows of the Academy, and the General Council subscribed from the funds of the Academy the sum of £50 towards the expenses of the meeting.

In consequence of this exceptional expenditure, and the diminution in the amount of subscriptions, the Council has not been in a position to invest any capital this year. The expenditure next year will also be considerably above the average, as the Council has, on the recommendation of the Council of the Pathological Section, ordered ten new microscopes (four with oil immersion lenses) for the use of the Academy. The cost of these instruments will amount to £120, and the Council believe that the money will be well spent in providing the Academy with a sufficient number of high class microscopes to carry on the work of the scientific evenings in a satisfactory manner.

It is with deep regret that the Council has to record the loss which the Academy has sustained during the past Session by the lamented death of Dr. Samuel Gordon, who

was for three years President of the Academy, and who as an Ex-President took a keen interest in its working, and was a regular attendant at its Council Meetings till within a few weeks of his death.

Death has also removed from our ranks several valued colleagues—Dr. Samuel Haughton, Mr. O'Grady, Drs. Montgomery Ward, Ringrose Atkins, and Austin Cooper.

General Treasurer's Account for the Session 1897-98.

RECEIPTS.		£	s.	d.	EXPENDITURE.		£	s.	d.
To Balance in Bank	-	-	-	96 9 3	By General Secretary	-	-	105 0 0	
" Subscriptions	-	-	-	486 9 0	" Printing, Stationery, and Postage	-	-	106 9 10	
" Dividends on £596 2s. 4d., at 2 $\frac{1}{2}$ per cent.	-	-	-	11 17 9	" Transactions, Vol. XV.:-	-	-	-	
" " £155 1s. 10d., at 2 $\frac{1}{2}$ per cent.	-	-	-	2 18 3	" Fannin & Co., Ltd.	-	£160 19 8	-	
" Fannin & Co., Ltd., part Cost of Illustrations—	-	-	-	-	" Illustrations,	-	40 2 0	-	
Vol. XIV.	-	-	-	2 10 0					201 1 8
Do. Vol. XV.	-	-	-	5 8 6	" Reporters	-	-	-	30 9 0
					" Servants	-	-	-	20 10 0
					" Groceries	-	-	-	19 16 10
					" Sundries	-	-	-	3 5 11
					" Royal College of Surgeons	-	-	-	15 15 0
					" Royal College of Physicians	-	-	-	15 15 0
					" Lantern	-	-	-	2 14 8
					" Microscopes, repairs	-	-	-	6 0 0
					" Deputation Expenses	-	-	-	7 7 0
					" Donation to Congress of the Royal Institute of Public Health	-	-	-	50 0 0
					" Balance in Bank	-	-	-	21 7 10
Total	-	-	-	£605 12 9	Total	-	-	-	£605 12 9

We have examined the Accounts and Vouchers, and certify the same to be correct.

{ F. T. PORTER NEWELL, F.R.C.S.
 { ROBERT H. WOODS, M.B., F.R.C.S.

October 10th, 1898.

The Capital is invested in the names of Sir George Duffey, Sir William Thomson, and Dr. Walter G. Smith.

Volume XVI. of the "Transactions" has been forwarded to the following:—

IRELAND :—

Dublin Medical Journal	-	-	-	Dublin.
Medical Press	-	-	-	Do.
National Library	-	-	-	Do.
Royal College of Physicians	-	-	-	Do.
Royal College of Surgeons	-	-	-	Do.
Royal Irish Academy	-	-	-	Do.
Royal Dublin Society	-	-	-	Do.
Royal University	-	-	-	Do.
Trinity College	-	-	-	Do.
Queen's College	-	-	-	Belfast.
Do.	-	-	-	Cork.
Do.	-	-	-	Galway

ENGLAND :—

Birmingham Medical Review	-	-	-	Birmingham.
Medical Institute	-	-	-	Do.
Dr. Ashby	-	-	-	Do.
Bristol Medical Journal	-	-	-	Bristol.
Medico-Chirurgical Society	-	-	-	Do.
University	-	-	-	Durham.
Provincial Medical Journal	-	-	-	Leicester.
Liverpool Medical Journal	-	-	-	Liverpool.
Annals of Surgery	-	-	-	London.
Society of Apothecaries	-	-	-	Do.
Asclepiad	-	-	-	Do.
British Medical Journal	-	-	-	Do.
Clinical Society	-	-	-	Do.
Royal College of Physicians	-	-	-	Do.
Harveian Society	-	-	-	Do.
Hospital Gazette	-	-	-	Do.
International Medical Journal	-	-	-	Do.
King's College	-	-	-	Do.
Lancet	-	-	-	Do.
Library, British Medical Journal, 429 Strand	-	-	-	Do.
London Medical Record	-	-	-	Do.
Royal Medical and Chirurgical Society	-	-	-	Do.
Medical Review (Med. & Surg. Review of Reviews)	-	-	-	Do.
Medical Magazine	-	-	-	Do.
Pathological Society	-	-	-	Do.
Pharmaceutical Journal	-	-	-	Do.
Practitioner	-	-	-	Do.
Public Health, 19 Bloomfield Road, Varda Val	-	-	-	Do.
Royal College of Surgeons	-	-	-	Do.
Sanitary Record	-	-	-	Do.

ENGLAND—*con.*—

University	-	-	-	-	London.
University College	-	-	-	-	Do.
Victoria University	-	-	-	-	Manchester.
Quarterly Medical Journal, Dr. Coching,	277				
Glossop-road	-	-	-	-	Sheffield.
Sheffield Medical Journal, 17 Eyre Street	-				Do.

SCOTLAND :—

Royal College of Physicians	-	-	-	-	Edinburgh.
Scottish Medical and Surgical Journal	-				Do.
Edinburgh Medical Journal	-	-	-	-	Do.
Royal College of Surgeons	-	-	-	-	Do.
University	-	-	-	-	Do.
Do.	-	-	-	-	Aberdeen.
Do.	-	-	-	-	St. Andrews.
Faculty of Physicians and Surgeons	-	-	-	-	Glasgow.
Glasgow Medical Journal	-	-	-	-	Do.
University	-	-	-	-	Do.
University College	-	-	-	-	Dundee.

EUROPE :—

Archives Cliniques de Bourdeaux, 46 Cours du					
Jardin-public	-	-	-	-	Bordeaux
Archives de Chirurgie, 108 Boulevard St. Germain,					Paris.
Journal de Médecine et de Chirurgie (M. Lucas,					
Championnière)	-	-	-	-	Do.
Revue de Chirurgie	-	-	-	-	Do.
Archiv Provinciales de Médecine	-	-	-	-	Do.
University College	-	-	-	-	Do.
Do.	-	-	-	-	Amsterdam.
Do.	-	-	-	-	Christiania.
Do.	-	-	-	-	Madrid.
Do.	-	-	-	-	Vienna.
Do.	-	-	-	-	Stockholm.
Society of Medicine, care of Dr. J. V. Wichman					Copenhagen.
Medical Society, Royal University	-	-	-	-	Upsala.
Naturforschende Gesellschaft, Dr. Rudolf Martin,					
Seefeldstrasse 119	-	-	-	-	Zurich.
University College	-	-	-	-	Bologna.
Archivio di Ortopedia (Dr. Pietro Panzeri,					
Instituto dei Rachitici)	-	-	-	-	Milan.
Archivio d'Ortopedia, via S. Calimbro 31	-				Do.
Académie Royale de Médecine de Belgique	-				Brussels.
University College	-	-	-	-	Do.
Société Belge de Chirurgie	-	-	-	-	Do.
Archiv für Klinische Chirurgie	-	-	-	-	Berlin.
Centralblatt für die medicinischen Wissenschaften					Do.

EUROPE—*con.*—

University College	-	-	-	-	Berlin.
Zeitschrift für Chirurgie	-	-	-	-	Do.
La Grèce Medicale, Syra	-	-	-	-	Greece.
University College	-	-	-	-	St. Petersburg

AMERICA :—

Academy of Medicine, 17 West 43rd Street	-	-	-	-	New York.
American Journal of the Medical Sciences	-	-	-	-	Philadelphia.
New York Medical Journal, 72 Fifth Avenue	-	-	-	-	Do.
University College	-	-	-	-	Do.
Do.	-	-	-	-	Philadelphia.
Do.	-	-	-	-	Quebec.
Do.	-	-	-	-	Toronto.
University Quarterly	-	-	-	-	Do.
Annuaire de l'Univ., Laval	-	-	-	-	Quebec.
American Journal of the Medical Sciences	-	-	-	-	Philadelphia.
Journal, American Medical Association	-	-	-	-	Chicago.
Brooklyn Medical Journal	-	-	-	-	Brooklyn.
Annals of Gynæcology and Pediatrics, 871 Beacon Street, Boston, Mass.	-	-	-	-	United States.
Charlotte Medical Journal, Charlotte, N. C.	-	-	-	-	Do.
Director-General Billings, Washington	-	-	-	-	Do.
Dr. Stockwell, Medical Age, Detroit, Michigan	-	-	-	-	Do.
Journal of Comparative Neurology, Denison University, Granville, Ohio	-	-	-	-	Do.
Journal of Comparative Neurology (Dr. C. L. Herrick), Granville, Ohio	-	-	-	-	Do.
Medical Library Association, 19th and Stout Street, Denver, Colorado	-	-	-	-	Do.

AUSTRALIA :—

University College	-	-	-	-	Adelaide.
Do.	-	-	-	-	New Zealand.
Do.	-	-	-	-	Melbourne.
Medical Society of Victoria, Melbourne (Meyer and Metzler, Great Portland Street, London)	-	-	-	-	Do.
The Australian Medical Gazette,	-	-	-	-	Sydney, N.S.W.
University of Sydney, care of Young J. Pentland, 38 West Smithfield, London, E.C.	-	-	-	-	Do.

ASIA :—

University College	-	-	-	-	Calcutta.
Do.	-	-	-	-	Bombay.
Do. Library	-	-	-	-	Tokio, Japan.



TRANSACTIONS

OF THE

ROYAL ACADEMY OF MEDICINE IN IRELAND.

MEDICAL SECTION.

RECENT CLINICAL EXPERIENCES OF SEPTICÆMIA AND ENTERIC FEVER.

By JOHN WILLIAM MOORE, M.D. UNIV. DUBL., P.R.C.P.I.;

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Professor of Practice of Medicine, Royal College of Surgeons in Ireland.

[Read in the Section of Medicine, November 18, 1898.]

IN the belief that much may be learned from simple clinical records, I venture to submit a series of cases of what I believe to be manifestations of septicæmia. The first case was that of an old gentleman, who died of septicæmic endocarditis occurring in the wake of chronic disease of the gall-bladder. The second assumed the form of sapræmic enteritis in the grandson of this gentleman. The third was an instance of acute desquamative dermatitis, apparently caused by contact with toxic graveyard soil.

I have also to present clinical records of two unusual cases of enteric fever. In the former of these, two true relapses occurred within two months. The first relapse ran a course of sixteen days, the second one of fourteen days. In the other patient the brunt of the poison seemed to fall on the tonsils, and, subsequently on the nervous centres, the intestines apparently escaping. Defervescence took place by crisis on the sixteenth day, the temperature chart in this respect resembling typhus rather than enteric fever.

CASE I.—On Wednesday, November 25, 1896, I was called to see an elderly gentleman, residing at Rathgar, who had been suffering for a day or two from incessant nausea and vomiting, with agonising paroxysmal pain in the right hypochondrium. He had rapidly become deeply jaundiced, urine was scanty and intensely dark, and any fæces which passed were clay-coloured and offensive. The region of the liver and gall-bladder was exquisitely tender on pressure. The liver was large, but smooth. A firm, globular rather than pyriform, tumour projected below its inferior margin, and was recognised as an enlarged and very tender gall-bladder. The patient was seventy-one and a half years of age; he had been in the Royal Navy, and had more recently served as a coastguard officer in Queensland, Australia. Up to December, 1894, when he was sixty-nine and a half years old, he had enjoyed excellent health. At the date mentioned the first of a series of attacks like that above described occurred. I had the advantage of perusing the following interesting notes of the case which had been taken by Dr. Wilton Love, M.B., C.M. Edin. (with Honours, 1884), of Brisbane, Queensland:—

"Nature of attack.—Mr. T. J., aged seventy-one years; seen first Feb. 12, 1896, complaining of intense pain in right hypochondrium, extending towards the umbilicus; rigors. Pulse small and intermittent; hands and feet cold, with clammy sweat. The treatment adopted was $\frac{1}{6}$ grain morphia and $\frac{1}{150}$ gr. atropin hypodermically.

"Next day he was out of pain, but deeply jaundiced; pulse somewhat stronger and less intermittent; only 8 ozs. urine were passed in 24 hours. There was no albumen, but the urine was deeply stained with bile. *Strophanthus* tincture miii. and strychnin gr. $\frac{1}{50}$ were injected hypodermically. The heart gradually recovered and the jaundice slowly disappeared, convalescence being delayed by a small abscess at the site of a needle puncture. This illness lasted about two months, and though careful search was made for gall-stones nothing solid was discovered.

"Frequency of attacks.—The above was probably the most severe attack the patient has had. In December, 1894, he had a somewhat similar attack, which laid him up for one week; this was the first attack. The patient gained health and strength, and remained well for nearly seven months. Next attack took place in November, 1895; much less severe, but similar to that described above. Attacks recurred pretty frequently during November, December, January, and February, 1895-1896.

Physical signs.—Liver dulness never more than a finger's breadth below costal margin. At one time after an attack an obscure tumescence could be detected between the right mammary line and the outer border of the rectus, but this was always carefully looked for and observed only once; it will be seen that it was not a constant symptom. Some tenderness complained of in this situation on palpation, especially during or soon after a paroxysm. When jaundice came on the skin-tint was very pronounced, urine deeply bile-stained, and the motions were clay-coloured. As a rule the jaundice cleared off in a week or less. Search was made in the stools for gall-stones, but for some time without result. In November, 1895, some small, yellow, putty-like concretions were found; these showed cholesterin, and were fairly soluble in ether. Large numbers of somewhat similar bodies have since been passed from time to time. Lately they have been quite insoluble in ether, but saponify readily with caustic alkali. When first voided they vary in size from a split pea to a marble, and are usually bright yellow in colour, elastic in consistence (like a gelatine capsule filled with mustard), and more or less globular or ovoid. Olive oil has been administered several times, but these appear to be quite independent of the use of oil—they did not appear before when taking oil, and were frequently passed many weeks after the oil had been stopped. After keeping for a few days they shrink and darken in colour, and finally dry into a brown brittle substance not unlike the withered kernel of a filbert nut.

Treatment in brief.—Cholagogues, phosphate and benzoate of sodium, olive oil, mineral waters, nitric acid compresses, milk dietary, have all been used from time to time as indicated.

Diagnosis.—I believe the patient to be subject to attacks of catarrh of gall-bladder, and formation and passage of biliary calculi of a somewhat unusual composition.

“WILTON LOVE, M.B. Edin.”

I saw every reason to acquiesce in Dr. Love's diagnosis, and prescribed Carlsbad salt, to be taken each morning; the bowels to be moved by compound aloin tabloids, and 30 minims of liquid extract of condurango to be taken in water twice daily before food. Fomentations were applied over the liver, and enemata of warmed sweet oil were administered.

On December 7, 1896, the patient was steadily improving. He was ordered to take 20 grains of benzoate of sodium with tincture of lemon and warm water in the early morning. On December 28

the note was—"Going on well, abdominal fulness less, getting rid of hard fæces mixed with soft stuff rich in bile."

I did not again see Mr. J. until April 22, 1897, when I found him wonderfully better, although a large abdominal tumour still occupied the epigastrium and the right hypochondrium. Mr. J. continued to enjoy excellent health until February, 1898, when he passed through a sharp attack of bronchial catarrh. This affected his heart, the failing strength of which caused me some anxiety for a while. Tincture of quinine with tincture of nux vomica appeared to have the happiest effect in restoring the tone of the heart-muscle, and the patient quickly recovered, enjoying good health until Friday, August 26, 1898. On the evening of the day named Mr. J. complained of fatigue and of pain in the stomach. This became more and more intense, and was soon accompanied by vomiting, constipation, and the discharge of scanty high-coloured urine.

When I visited Mr. J. for the first time on Monday, September 5, he looked wretchedly ill, and the pain in the right hypochondrium was so intense that I gave a quarter of a grain of morphin hypodermically. Next morning jaundice was showing, and in a few days he had become intensely jaundiced. For some days both pulse and temperature remained subnormal. The liver was much enlarged; its surface was smooth. It was very firm, and exquisitely tender to the touch. The bowels were at first obstinately constipated, but on Saturday, September 10, great quantities of foul-smelling, mortar-like stuff, mixed with much blood-streaked mucus, began to pass from the bowels. The pulse now rose from 80 to 100, but the temperature remained at 97.9° . On Sunday, September 11, the patient was very prostrate and typical Cheyne-Stokes' respiration had set in. Dr. Craig saw him in consultation with me on the next morning, when he seemed to have rallied somewhat, chiefly under the administration of stimulants.

On Thursday, the 15th, for the first time a pericardial friction was to be heard. The pulse was soft, beating at the rate of 72. The axillary temperature was 97.4° ; superficial bedsores were forming. Bile was now passing freely from the bowels, and the urine was less dark.

An endocardial murmur, systolic in time and heard best at the apex, now developed, and the failing cardiac impulse showed but too plainly the presence of an ulcerative endocarditis, the outcome of septic infection. Further evidence of such a condition was afforded by the rapid development of a wide-spreading erythema,

and by an increasing pyrexia. Purpuric patches and petechiæ appeared in all directions.

Quantities of bile and mucus kept flowing from the bowels. Complete anuria set in, lasting for many hours, and the patient sank into an apathetic, stuporous state, from which he could with difficulty be roused. Nothing could surpass the fœtor of the sick-room at this time—as a matter of fact it caused one case of serious illness in a member of the sick man's family. The patient died at 10 35 a.m. of Thursday, September 22, about four weeks from the date of the attack. A *post-mortem* examination could not be made, owing to the non-consent of the relatives. The medical certificate of the cause of death was filled in thus—Primary: Cholecystitis, four weeks. Secondary: Septicæmia and endocarditis, one week.

CASE II.—On Saturday, September 24, 1898, I was summoned to see this old gentleman's grandson, Mr. R. B., aged nineteen, a medical student, who had been complaining for about a week of loss of appetite, sickness of stomach, and finally vomiting and diarrhœa, with fever. I found him in bed, looking exceedingly ill, with a thickly coated tongue, a rapid pulse (116), and an axillary temperature of 103·0°. He was passing frequent stinking motions from the bowels. His bedroom was in the return building, close to the water-closet in which the discharges from his grandfather had been kept for medical inspection. He himself attributed his illness to the unwholesome smells from this water-closet and in his grandfather's bedroom. I strongly urged that the patient should be at once removed from the insanitary surroundings, and accordingly he was, the same evening, admitted to a private ward in the Meath Hospital. He immediately began to improve, and in four days was convalescent. The only medicinal treatment was half ounce doses of the castor oil mixture of the British Pharmacopœia, 1898, with 7½ minims of compound tincture of chloroform and morphin (1898) every six hours. These castor oil draughts were discontinued on September 28th, when he was allowed chicken and bread and butter. I called the case "Septic Enteritis"—perhaps "Sapræmic Enteritis" would be a better term. The temperature observations were as follow:—

		A. M.	P. M.
September 24	...	?	103·2°
" 25	...	100·6°	100·6°
" 26	...	98·4°	99·6°
" 27	...	98·4°	98·7°
" 28	...	97·2°	97·9°

CASE III.—On Thursday, October, 20, 1898, Mrs. Mary Anne B., a widow, aged fifty-seven, whom I had known for at least twenty years as an exceptionally healthy woman, drove to my house in a hackney cab to consult me at my home-hour. She seemed weak and very ill. Her tongue was thickly coated. Herpetic ulcerations studded her lips and mouth. Her fauces were injected, and she had a soft cough which brought up a muco-purulent sputum with ease. Her pulse was quick and weak, but her temperature did not exceed 99°. Her hands, chest, neck, and the left leg were still beset with a scarlatiniform rash which had appeared for the first time on Sunday, October 16th, coming out in the following order—hands, wrists, left leg only, neck, chest, and stomach. The hands had swelled considerably after the rash came out, and they and the other parts invaded by it were intolerably itchy. Desquamation was already beginning on the hands, neck, and left leg, the skin on this leg being uplifted like the great scales of dermatitis exfoliativa. This leg had been the seat for many years of some varicose veins.

Believing that I had to deal with a case of dermatitis venenata, I questioned the patient at some length. I asked her had she been handling poison ivy (*Rhus toxicodendron*), a plant which it turned out she knew quite well, as also its toxic effects. At last I elicited the following history:—On Thursday, October 6th, she visited the grave of her daughter in one of the metropolitan cemeteries, that day being the birth-day of the deceased. She carried with her to the grave a bouquet of white flowers and some plants, with which to decorate it. She had neither spade nor trowel, and she carefully took off her gloves in order to avoid spoiling them. She then knelt down on the ground presumably on one knee—the left one—and with her hands proceeded to scrape up the soil in handfuls, and to plant the roots or slips she had brought with her. After doing this, she returned home without having had an opportunity of washing her hands.

Mrs. B. took ill three or four days afterwards, feeling sick, languid, and weak. On Tuesday, October 11, she vomited and felt her throat sore. On the following Saturday, the symptoms increased, the skin became intensely itchy, and next day, as already stated, the rash came out in the order mentioned—first on the hands and wrists. Mrs. B. convalesced very slowly. On Saturday, November 12th, she was attacked with a pleuritic stitch in the left side, and since then she has been passing

through an attack of sub-acute left pleuritis, with a very perceptible new leather creak.

On November 16, Dr. H. C. Earl examined a specimen of the very abundant muco-purulent sputum which was coming up. He reported as follows:—"This sputum contains no tubercle bacilli. There are very few micro-organisms present, and these are almost entirely staphylococci."

It is, perhaps, to the purpose to mention that this patient's deceased daughter, a married woman, aged thirty, had a rigor on Wednesday, March 9, 1898. Next day I saw her and found the base of her left lung already solid, pulse 128, respirations 28, temperature 103.2° . This pneumonic fever ran a severe course, temperature rising to 104.7° even in the morning on March 17, and ultimately terminated in death on the twelfth day (March 20, 1898).

That the soil may become poisonous when the nitrifying process, which converts ammonia and organic matters into nitrous and nitric acids, is interfered with by non-aëration of the soil, or through a deficiency of lime salts, which facilitate the combination of these acids with bases, is quite intelligible. While the natural tendency is for the soil to purify and render innocuous the products of decomposition, under special circumstances this salutary process may not take place, and danger to health may result.

Dr. George Wilson, Medical Officer of Health for the Mid-Warwickshire, Combined District, observes in the eighth edition of his *Hand-book of Hygiene and Sanitary Science*^a:—

"It is being made clearer every day that the relations of soil to disease depend mainly upon its characteristics and conditions as a breeding ground for micro-organisms. Pettenkofer and others had long ago maintained that the soil exercised a specific influence on the development and spread of infective germs, but up till quite recently it was held by bacteriologists that so-called pathogenic organisms were not, as a rule, propagated in soil, because they were crowded out or destroyed in the struggle for existence by the saprophytic organisms. . . . But the recent researches carried out for the Local Government Board by Dr. Klein, Dr. Sidney

^a London: J. & A. Churchill. 1898. Page 356.

Martin, Dr. Cautley, and Dr. Andrews, go far to show that 'soil and circumstances,' as Sir Richard Thorne has so forcibly phrased it, do exercise a most powerful influence on the propagation, as well as control of pathogenic organisms, and that the old doctrine of filth and nuisance polluting air and water being prime factors in the causation of certain diseases, designated as filth diseases, still holds good."

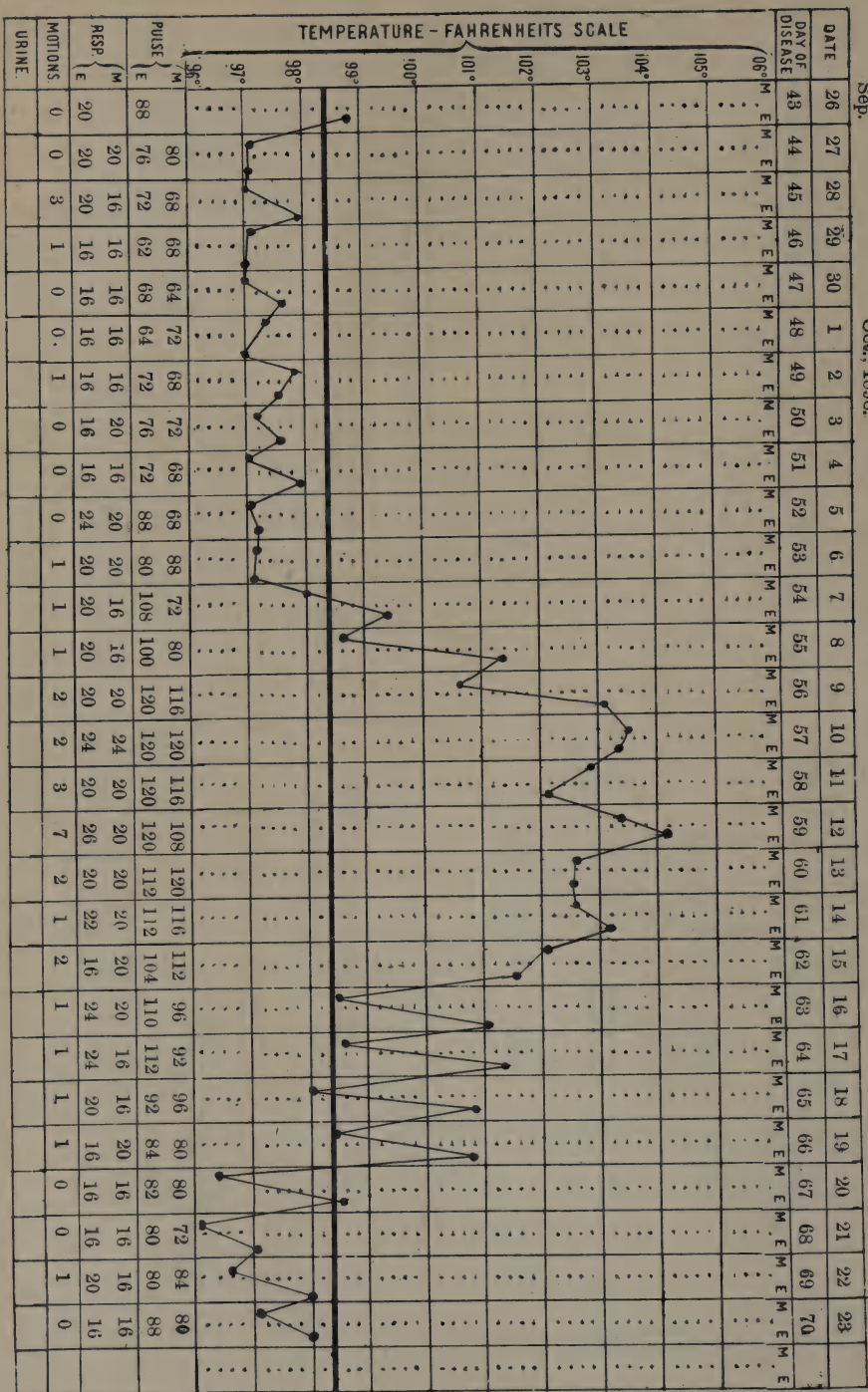
The possible, if not the probable, causal relation of the state of the soil to Mrs. B.'s illness must therefore be conceded.

CASE IV.—On the afternoon of Sunday, August 28, 1898, I visited at Howth, in consultation with Dr. Wm. Greene, Miss Etta M., aged nineteen and a half years. She had been ailing since Tuesday, August 16, and was believed by Dr. Greene to be, at the time of our visit, on the 13th day of typhoid fever. At 4 40 p.m. her temperature was $103\cdot7^{\circ}$. The tongue was red and dry in the centre. There were a few rose spots. The spleen was considerably enlarged. The abdomen was distended and tympanitic. There was a serious amount of bronchial catarrh—almost justifying a diagnosis of broncho-pneumonia. As the patient was staying in a lodging-house, it was deemed advisable to remove her, and accordingly two days later she was admitted to a private ward at the Meath Hospital. There she progressed favourably and, after what seemed to be a final burst of fever on the 20th day ($103\cdot8^{\circ}$), appeared to be approaching convalescence. On the 24th day, however, she was not so well. The catarrhal symptoms increased, her tongue became coated, and gradually grave cerebral symptoms developed—delirium, sleeplessness, and tremor.

On the morning of September 13th—the 29th day from the beginning of Miss M.'s illness and the 6th day of the second fever—the temperature marked $105\cdot6^{\circ}$, the pulse being 128, but the respirations not exceeding 30. Although the fever ebbed by degrees, Miss M.'s condition for the following week or ten days was most disquieting. Nevertheless, she emerged from this second fever unscathed and remained apyrexial for a fortnight precisely. Indeed, during this period the temperature was almost persistently subnormal, while the pulse fell to 64. Towards the close of this intermission, Miss M. complained of severe pains and tenderness in her feet and in the muscles of the legs and thighs, and the latter began to waste quickly, so that a diagnosis of infective peripheral

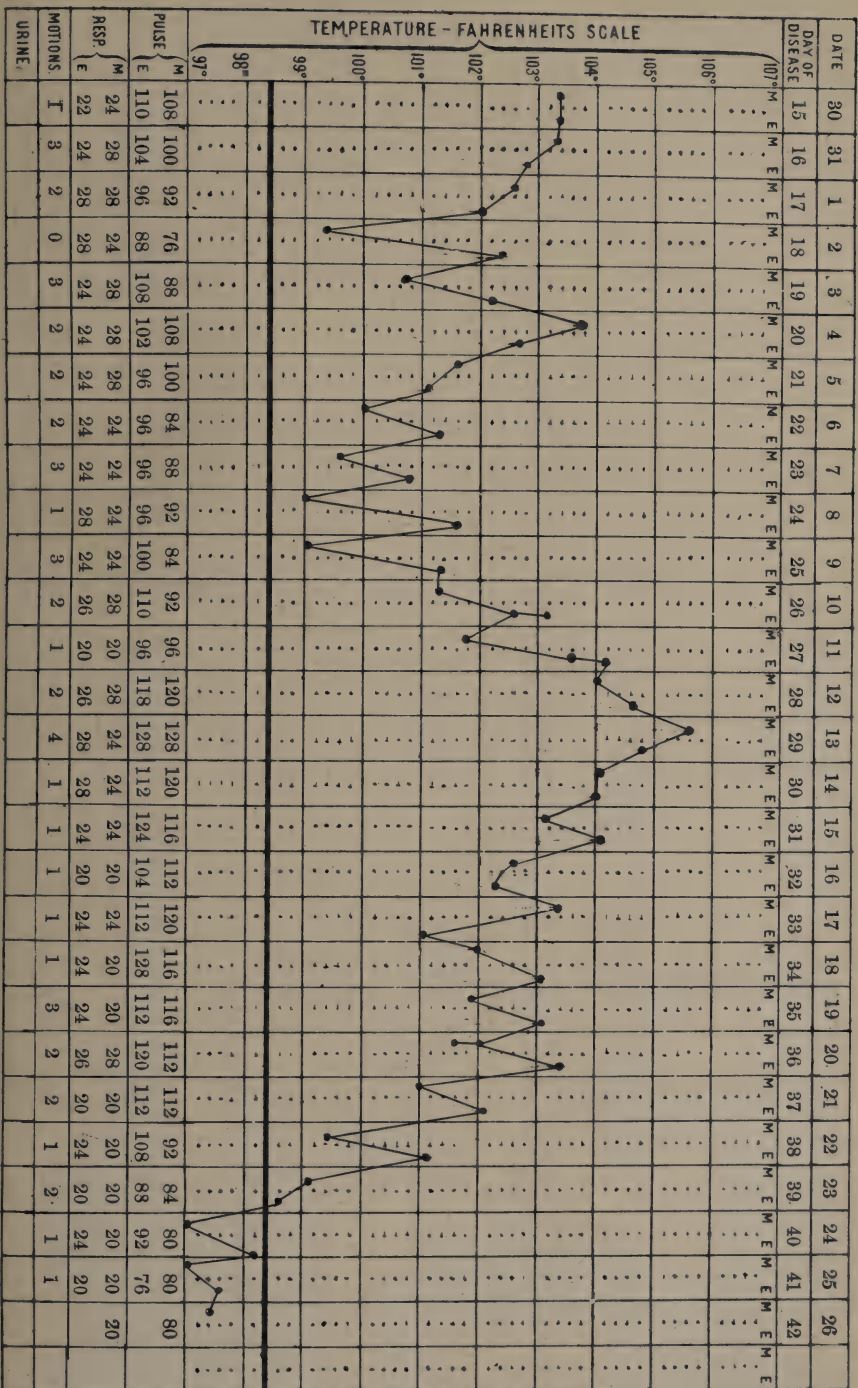
Disease—Enteric Fever.

Oct., 1898.



Disease—Enteric Fever.

Sep., 1898.



neuritis was made. On October 7 (the 54th day from the beginning of the fever) the temperature began to rise for the third time, and Miss M. passed into another fever of fourteen days duration, the highest recorded temperature being 104.2° on the evening of the 6th day. Scarcely had this fever become established when the pains and tenderness in the feet and legs lessened, and in a fortnight they had all but disappeared. From the 3rd to the 7th day inclusive of this attack there was considerable diarrhoea, as many as seven motions being passed on the 6th day. The temperature chart in this remarkable case is appended.

Here was an instance in which two true relapses occurred in typhoid fever within two months. The first ran a course of 16 days, the second one of 14 days. The patient left hospital on Tuesday, November 8th, the eighty-sixth day from the beginning of her illness. Two days later she was looking and feeling well, except that she still complained of pains and tenderness in her legs and feet.

CASE V.—Edward D., aged twenty-one, a driver, was admitted to the Meath Hospital on October 26, 1898, on the fourth day of his illness, which was described as “acute tonsillitis.” Next morning I examined him. His temperature was 101.4° . Although the fauces were abnormally red and congested, there was no material enlargement of the tonsils. The spleen was enlarged, but only two or three doubtful rose spots were observed on the front of the body. The pyrexia daily increased until a maximal reading of 106° was recorded at 5 p.m. of November 1st, the tenth day of the attack. The pulse rate was only 102. There was a great deal of capillary congestion, like typhus. The cerebral stain (*tache cérébrale*) could be elicited with the greatest ease on drawing the finger-nail across the skin. The resulting red streak was intensely vivid and lasting. At this time the patient's condition appeared critical. He was placed in the wet pack, and tepid sponging was used with good effect. An improvement soon showed itself, and on the sixteenth day a deferescence by crisis occurred. After four days apyrexia the temperature spiked slightly in the evening, and severe catching pain was complained of in the right infra-axillary region. This was evidently caused by a pleuritis sicca, for a *bruit de cuir neuf* was

heard on auscultation, and occasionally friction fremitus was felt in the intercostal spaces near the seat of pain.

In this case the brunt of the poison seemed to fall on the tonsils—that first line of defence against the invasion of pathogenic micro-organisms—and subsequently on the nervous centres. The intestines apparently entirely escaped.

Although defervescence usually takes place gradually in typhoid fever—that is, by lysis—yet it may occur suddenly—that is, by crisis. Some years ago Dr. H. T. Bewley, F.R.C.P.I., kindly permitted me to publish a clinical chart of such a case. In November, 1897, a very similar example of typhoid fever of short duration came under my observation in the epidemic wing of the Meath Hospital, in the person of a man, aged thirty-three years, who defervesced by crisis in the second week of his fever.

ACUTE HÆMORRHAGIC ASCITES.

By J. MAGEE FINNY, M.D., F.R.C.P.;

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King's Professor of Practice of Medicine, School of Physic.

[Read in the Section of Medicine, November 18, 1898.]

I HAVE elected to present the following case to the Medical rather than to the Pathological Section of the Royal Academy of Medicine, as the interest lies in its clinical quite as much as in its pathological aspect, and for the same reason I have designated it under the title of "hæmorrhagic ascites," as embodying its most prominent and, indeed for some weeks, its sole characteristic.

It is the only case I have met with, or heard of, in which effusion of sero-sanguinolent fluid in the peritoneal cavity was so copious as to necessitate tapping, and in which this necessity became so often imperative, and at such short intervals, if life was to be prolonged.

Mr. G., aged forty-two, married, of a healthy, clear complexion, a full build, weighing over 14 stones, came under my care on Sept. 30, 1897, on the recommendation of Thomas Parr, M.D., of Drogheda, complaining of gastric symptoms, a sense of fulness and hardness in the epigastrium, with a feeling of soreness.

His history pointed to an active life and habits. In May last he rode 40-50 miles on his bicycle, and up to the time of his visit he rode 10-15 miles many days, and was able to walk and shoot. Indeed, in the interval of ten days which followed his visit to me, he went out partridge-shooting, and walked about eight miles over the country, although he found some difficulty in crossing the fences and ditches, and experienced pain in the epigastrium on jumping.

His habits were temperate and he lived a regular life, his only complaint being asthma, which was brought on by dust or flour, and which was immediately relieved by going out yachting.

The earliest hint of not being quite well was a sudden sickening pain and faint feeling which he experienced about two months ago, when a friend in conversation, in order to point his remarks, poked him slightly in the epigastrium with his finger; and, again, when his pet setter dog touched him in the same place with his paw to call his attention during meals to, his—the dog's—wants. These slight shocks made my patient quite sick and faint. His appetite was good, and he was, both before and after he came under my care, able to eat meat, game, fish, and fruit and vegetables; and even on the day preceding his death he partook of oysters, and grouse and fruit. He experienced discomfort only from flatulency after vegetables, and if the bowels were confined. There never was vomiting or diarrhœa, or jaundice; and no blood was ever present in the alvine discharges.

When first seen his abdomen was noticeably enlarged, and was tense with ascitic fluid, and measured 43 inches above and at the umbilicus.

At his second visit, a fortnight later, his abdomen was still more tense, and measured 45 inches, while his body-weight had gone up from 14 st. 2 lbs. to 14 st. 7 lbs.

As the abdominal walls were tense as well as well covered with fat, it was not possible to palpate the organs. Percussion elicited dulness in both flanks and in the hypogastrium. On placing the patient on the left side the right flank became clear, but on reversing this position the left flank and side, when uppermost, did not give a clear note, and the dull note tended to pass up towards the spleen. Liver dulness was not increased; if anything its area was diminished.

It was now decided to relieve the distress by tapping, and on Oct. 11th 100 fluid ounces were withdrawn by siphon tube. The moment the trocar was introduced the fluid gushed out—an evidence of the great pressure it was subjected to. To Dr. Parr's and my surprise the colour of the fluid was that of blood, its resemblance to it being exact, except that it was of a slightly maroon shade. The sp. gr. of the fluid was 1025, and on standing a soft blood-stained sediment to about one-tenth or one-eighth of the volume was formed.

It was thought at the moment of the first tapping that some blood vessel had been punctured by the trocar, but this was negated by the even flow of equally stained fluid to the end of the operation. Under the circumstances it was thought best not to drain the

cavity completely, so the trocar was withdrawn when 100 ozs. had flowed off. The measurements of the abdomen after tapping were 42 inches at the epigastrium and 43 at the umbilicus. After removal of the liquid careful examination failed to make out any tumour anywhere, or any enlargement of, or inequality on, the surface of the liver. It was noticed, however, that while the greater part of the abdomen gave a clear percussion note, the left side from the costal arch down to near Poupart's ligament remained comparatively dull.

As the fluid drained off the patient complained of soreness to the right of the puncture, and after the tapping, as before it, of a tenderness in the epigastrium on palpation or slight percussion.

It was hoped that the relief which the tapping gave would be followed by increased activity of the kidneys, and saline cathartics and diuretics were administered with a view to encouraging the urinary secretion and absorbing the ascitic fluid.

Disappointment, however, awaited us on both these points, as the urine never exceeded a pint in the 24 hours during the subsequent course of the case, the average quantity being 13 ozs., and the ascites rapidly reformed. The urine was bright and clear when passed, sp. gr. 1025, free from sugar or albumen, and on standing deposited a heavy sediment of light-coloured lithates.

On Oct. 17th I had the advantage of Dr. Purser's opinion, and, though the ascites was rapidly reforming, we advised the postponement of tapping as long as was practicable.

It could not, however, be delayed beyond October 20th—nine days from the former tapping—as the want of sleep, the breathlessness and general distress, made it imperative. On this occasion 212 fluid ounces were withdrawn by siphon tube, and it was allowed to issue as long as it would. The nature of the fluid was identical with that of the first paracentesis. Dr. Purser kindly examined the blood-stained ascitic fluid, and failed to find anything in it beyond blood corpuscles and a few large spheroidal cells common to serous membranes. The patient felt well and in excellent spirits for a few days after each tapping; he enjoyed his meals, and went out for a drive in a carriage with easy springs, or in the electric tram to Blackrock or Kingstown—any jolting over rough ground causing abdominal pain. The pulse was usually quiet (about 90), and the temperature about normal, though in the majority of observations it lay between 97° and 98°. It touched 99° on but three evenings, and rose to 100° on the day of his death. The

suspicion that the ascites was due to malignant disease and not to cirrhosis was now becoming more confirmed, while another feature, pointing in the same direction, should be mentioned—viz., after each tapping it was noticeable that the upper measurement of the abdomen was not so reduced as at the level of the umbilicus, and that the shape of the abdomen never much altered all through the course of his illness, and tapping made no difference in it. As the patient lay on his back the abdomen protruded forwards, while in the lateral directions, in contrast to what is usually the case in ascites from cirrhosis of the liver, there was no bulging of the flanks, nor was there any protrusion of the umbilicus. When very tense a few veins were visible, ramifying on the abdominal parietes, and œdema of the feet and front of the tibiæ would appear, and, later on, œdema of the scrotum and penis. These evidences of pressure became less after tapping. After the full drainage of the peritoneal cavity on 20th, the measurements were $40\frac{1}{2}$ and 41 inches; but on 24th they rose again to 42 and 45 inches.

The second paracentesis of the 20th was followed by a third on the 24th, when 184 fluid ounces were withdrawn, and, five days later, on the 29th, by a fourth tapping, which produced 274 fluid ounces. Thus, 790 ozs., or $38\frac{1}{2}$ pints, were evacuated within 18 days.

The drain of this enormous quantity of sero-sanguineous fluid showed its effects by causing considerable weakness, a continued acceleration of the pulse, and dropsy of the feet and legs, which, though increased when the ascites was well marked, never disappeared after the third tapping.

The colour of the face and lips was wonderfully little altered up to this date, but pallor and a somewhat pinched look set in soon afterwards.

As each tapping gave but temporary relief to the more urgent symptoms of breathlessness on exertion, want of sleep, and nausea and sickness after food, it was determined to postpone the next tapping as long as possible, an opinion in which Dr. Little, who saw him with us on Nov. 1, 1897, quite concurred.

It became evident, however, on Nov. 5, five days later, that the heart was labouring very much on account of the diaphragm being pressed up, and the pulse became very quick, thready and irregular. The patient was clamouring for relief, and we felt that if life was to be prolonged for even 24 hours the fluid must be let out. Dr. Ball was, therefore, called in late at night, and removed 261 ozs., and the patient experienced some but not at all the usual

amount of relief and bodily ease which paracentesis invariably had given him on former occasions. The heart, moreover, did not get slower, and it was apparent the vital powers of the patient were ebbing fast, and he died 40 hours afterwards by gradual failure of the circulation, and increasing coldness of the extremities, the mind being clear up to four hours before death, which occurred on Nov. 7th.

Even in the short time preceding death after the last tapping the abdomen again filled fast, and contained a couple of quarts when the autopsy was made on the 7th. Exclusive of this amount, so found, 1,031 fluid ounces—*i.e.*, $51\frac{1}{2}$ pints, or $6\frac{1}{2}$ gallons—were withdrawn in less than four weeks from the time the first tapping was practised on October 11th.

Approached from the clinical side, this case was one of no little difficulty in the matter of diagnosis, and presented many features of peculiar interest.

The presence of ascites in a man of the age of forty, who was not a total abstainer, and who at times, and on festive occasions, indulged in wine and spirits, and in whom neither cardiac nor renal disease was present, might be set down, as a general rule, to cirrhosis of the liver; and, at first, this was the diagnosis. The deep blood-stained fluid which flowed on the first paracentesis made that diagnosis doubtful, and this doubt was increased by the same coloured fluid being removed on a second tapping; and yet, on the other hand, the very rapidity with which the abdomen refilled, the large quantity of fluid which reformed in a few days, the absence of all tumours, which had been most carefully searched for after the emptying of the peritoneal cavity, and the apparent diminution in the area of hepatic dulness examined under similar circumstances, taken with the low specific gravity of the ascitic fluid, gave probability to the view that portal obstruction might still prove to be the cause. To explain the bloody character of the fluid was not easy, and the hypothesis was suggested that the bleeding occurred from a traumatic rupture of some vessels

in the mesentery or the omentum, which might have occurred in the first week of October while the patient was out shooting. In favour of such a possibility, inquiry had elicited the fact that, owing to the size and weight of the abdomen, the patient, who weighed over fourteen stone, found it hard to cross the ditches and fences, that it "hurt him in his stomach" if he jumped, and a bystander observed on one occasion that he fell, or rolled over on his abdomen, in attempting to cross a fence.

The points which made the diagnosis of cirrhosis doubtful from the first were the absence, prior to the dropsy, of gastric disturbances, such as sick stomach, dislike to food, and coated tongue; of varices on the nose; of bleeding from piles; enlargement of the spleen, hæmatemesis or melæna; and the healthy and well-nourished condition of the patient, with a cheery, bright disposition and a good appetite, which continued up to a week before his death. Another and a very significant symptom which negatived liver degeneration was the absence in the urine of biliary pigments or the purpurates, and the presence of amorphous urates in large quantities.

The absence of constitutional disturbance, fever of the hectic type, dryness of the tongue, and diarrhoeal attacks excluded phlebitis of the vena portæ, tubercular disease, or perihepatitis; while the absence of glandular enlargement in the groins and neck, of disease in the rectum, and of any distinct tumour in the abdomen negatived the probability of a new growth in or under the liver causing obstruction of the vena portæ by its pressure.

There was also a point in the physical examination which was difficult of solution, and that was the unequal range of percussion dulness over the abdomen all through the course of the case. Instead of the flanks and iliac regions, as the patient lay on his back with the shoulders

slightly raised, presenting an equally dull note, changing to the dependent side on change of position, in this case the right loin and iliac region were comparatively resonant and the left dull on percussion, and this dulness extended up towards the left hypochondrium in the mammary line, and did not change on turning the patient on his right side.

Having thus discussed the features of the case from a clinical point of view, I may say that each tapping after the first made us more sure that the cause of the dropsy was not the usual one of hepatic cirrhosis.

Although we had never met a similar case, nor could call one to mind, we were more and more inclined to the idea that it was a case of malignant disease involving the peritoneum, either the transverse mesocolon or the omentum.

The *post-mortem* examination was conducted under very great difficulties on the day following death, when I had the valued assistance of Dr. Purser. On making the primary incision, the parietes were covered with a considerable layer of fat, and the places where the several tapplings were made were quite healed up with healthy cicatrices. A large quantity, about two quarts, of deep blood-stained fluid escaped—of the same nature apparently as that removed by tapping, but along with it a number of deeply pigmented shreds of soft consistence. The intestines were mostly lying towards the right side, and the omentum occupied the front and left side of the exposed parts, extending exactly to the seat of puncture in the middle line and to the iliac spine on the left side. It formed a thick mass, gradually shelving from $1\frac{1}{2}$ inches thick at its attachment above to $\frac{1}{4}$ inch at its free border. It was solid and firm, but its consistence was such that it broke down on handling, while blood seemed to ooze from every part. The reflected part over the transverse colon was

similarly involved, but the bowel itself was unaffected and bulged rather forward near the hepatic flexure, and probably caused the fulness in that region, which suggested the idea to some of those who examined the patient during life that there might be a tumour below the liver. It also accounted for the clear resonant note across the epigastrium, which was constantly present. The liver was with difficulty brought to view, as the inflated condition of the colon and the great thickening of the omentum and mesocolon pressed it back towards the spine. The organ was normal in size, its surface smooth, and its edges of natural consistence. Without a much more complete examination than we were enabled to make, it was not possible to see whether the vena portæ was compressed in the fissure of the liver, but nothing could be felt of the nature of a tumour there, and we considered that the enormous vascularity of the new growth, which extended back to the spine and involved the inferior mesenteric and other veins, was quite sufficient to explain the copious serous and sero-sanguinolent exudation which had taken place. Scattered over the intestines, in isolated spots, and on the parietal peritoneum above the pubes, were seen a number of secondary growths—some the size and colour of drops of tallow or fat, others larger—without surrounding vascularity; they were readily detachable, and did not leave a broken surface. The spleen was very slightly enlarged.

Dr. Purser, who has kindly examined a portion of the omentum, considers the growth to be of "a sarcomatous nature, although the structure varies a good deal. The great number of newly-formed, very thin-walled vessels is interesting; also the abundant growth of cells from the walls of the vessels. Indeed the tumour seems chiefly to grow from the vessel wall." It is, doubtless, to this vascularity that the exudation of blood took place, and also the

effusion of the large quantity of serum which so rapidly refilled the peritoneum after tapping.

Remarks.—That hæmorrhagic ascites must be a most rare occurrence will probably be conceded by most of my hearers, as neither any of my medical *confrères* with whom I have consulted nor I myself, had ever seen or heard of such a case. It was not, however, until I looked up the literature of the subject in the Library of the Royal College of Physicians that its rarity was fully impressed upon me.

I investigated a search under the heading of "Ascites" in both scientific studies of the subject and clinical records; again under the head of "pathological diseases of the peritoneum"—and I included all kinds of malignant disease—cancer and sarcoma of the abdominal cavity, its walls or its contents—in any of which this symptom (hæmorrhagic ascites) was mentioned or referred to.

The results were largely negative. For instance, there is no case of peritoneal cancer or sarcoma recorded in the Transactions of the Pathological Society of London up to 1897, or of its older sister in this city.

Braithwaite's "Retrospect," from 1860–1897 inclusive, and the *London Medical Record* (1873–90) are silent on the subject. In the Index Catalogue but two references are given under the heading of ascites, viz.:—Thaon, L., *Note sur un cas d'ascite hémorrhagique* (Nice Med., 1877, I., p. 198), and Bessirard (L. E. A.) *Étude clinique sur l'ascite hémorrhagique*, quarto, Paris, 1882 (unfortunately I had not the means of referring to the original papers); while under the heading of "Diseases of the Peritoneum" there is no reference made to this prominent symptom.

In the *Archives gén. de Méd.*, 1877, C. Méhu, in a paper entitled "A Study of Pathological Liquids in the Cavity of the Peritoneum," briefly refers to a case of bloody ascites in cancer of the abdominal walls, in which paracentesis was

practised. In eleven days a second puncture became necessary, when the fluid removed was almost free from blood. Méhu, in speaking of the diagnosis of cancerous tumours in the abdomen, considers a notable quantity of blood in the ascitic fluid as a strong indication of such a pathological condition, but he adds the cautious qualification, that although a most grave prognosis is justifiable in the presence of such bleeding, the blood effusion may be found after death to be due to quite another cause.

Naturally my researches included the standard works of von Ziemssen's "Encyclopædia of Medicine," Trousseau's "Clinical Lectures," and Niemeyer's "Practice of Medicine," but with the same negative result.

In Fagge's "Principles and Practice of Medicine," p. 479, ascites is stated to be the most frequent symptom, and the most marked effect, of malignant disease of the peritoneum, and yet its hæmorrhagic nature is not mentioned.

My researches through the *Lancet*, *Brit. Med. Journal*, and *Medical Times and Gazette* met with little further success, as only a very few cases of hæmorrhagic ascites are reported. To these I shall allude briefly, as they show considerable diversity in the pathological conditions present, as well as in the amount and nature of the ascites.

Dr. Woodhouse^a records a case of a man aged sixty-four who presented an emaciated, cachectic appearance, and whose abdomen was greatly distended with fluid. Fluctuation was readily detected, although the parietes were tense. There were no varicose veins visible. The urine was very scanty and thick with urates but free from albumen or bile. Vomiting was the most distressing symptom, and the patient died of exhaustion in two months. The abdomen was found to contain three gallons of sanguineous serum. The peritoneum was yellow and thick, with the omentum

^a *Lancet*. Vol. 2. 1861. P 230.

converted into a solid hard cake. The pylorus was narrowed, and the transverse colon was constricted by a band.

The disease, which Dr. Bristowe declared to be a colloid cancer, began in the peritoneum and extended into the intestines.

Dr. Birkett,^a at the Newcastle Pathological Society, exhibited a case of gelatiniform cancer of the omentum, in which the latter was upwards of three inches thick, occurring in an old gentleman. The prominent symptoms were marasmus, ascites (though the nature and amount were not mentioned), and great abdominal suffering, which preceded and quickly caused death.

In bold contrast with the foregoing I would refer to another case of cancer of the omentum.

Dr. B. Fenwick^b showed a specimen of carcinoma of the omentum—where it was $1\frac{3}{4}$ inches thick—hard and firm, but in which all the pelvic contents were matted together in scirrhus and fibrous tissue, but there was a complete absence of dropsy except in the left pleura.

Dr. Matthews Duncan^c discusses the difficulty of the diagnosis of ascites due to malignant disease in the abdomen and in relation to ovarian disease; and gives the notes of a case—a woman, aged forty-two—in which 130 oz. of a bright red colour was drawn off, and in 18 days 70 oz. more were removed, and where the dulness on percussion was much the same after tapping as before; on exploration of the abdomen a number of soft nodules flowed out, and cancer of the uterus and ovary was found to be present.

These few references, which were all my diligent research could provide, alike speak of the paucity of the published cases, of the want of agreement in the pro-

^a Med. Times. Vol. 2. 1852.

^b Trans. Path. Soc. Lond. 1882.

^c Med. Times. Vol. 2. 1872. P. 432.

minent symptoms, and of the very general presence of solid tumours in intra-peritoneal malignant disease.

It will be readily acknowledged that the greatest difficulty in diagnosis arises in those very cases where tumours cannot be detected. I shall now conclude this paper with short quotations from the writings of the few authors who have discussed the question.

Dr. Samuel Fenwick^a has dealt with the subject more fully and exhaustively than any other writer, so far as I am aware. Under the heading of "Soft Cancer of the Peritoneum" he remarks on the presence of ascites in every case sooner or later, and that the character of the fluid was bloody in all but one of his collected cases, and he states from his experience—"Blood-stained serum is more commonly met with in this than in any other form of malignant disease affecting the peritoneum."

Tumours are necessarily always present, but in two instances they were not discovered during life, and in some others they were found only after the fluid had been removed by tapping.

"The amount of the ascitic fluid in miliary carcinoma of the peritoneum is always sufficient for recognition by ordinary physical examination," but in alluding to the difficulties of diagnosis he states—what was certainly not borne out by my case—that "ascites is less in quantity in cancer of the peritoneum than in cirrhosis of the liver; it is not so quickly reproduced after tapping, and it more often is followed by a rise of temperature and other symptoms indicating inflammation of the peritoneum."

Dr. Stokes was in the habit of teaching as characteristic of visceral cancer two main signs—(1) varicosity of the superficial veins over the abdomen; and (2) the presence of a small, though persistent, amount of ascites.

^a Clinical Lectures on Obscure Diseases of the Abdomen. P. 212. 1889.

Our acceptance of diagnostic *dicta* such as the foregoing must, therefore, be guarded and modified by the occurrence of cases like that of Mr. G.

Dr. Fenwick speaks also of miliary carcinoma occurring in an acute form, and mentions its being sudden in three instances, while supposed to be in robust health. He remarked that "its duration may be short—six weeks to four months.

Habershon,^a referring to abdominal cancer as a cause of ascites, writes:—"There is an instructive class of cases in which the peritoneum is especially diseased. The serous membrane is studded with tubercles, soft and vascular, and composed of cancer cells, the mesenteric glands, and omentum sometimes are infiltrated with inflammatory and cancer products, so that it becomes thickened, contracted, and hard. It probably begins in the subserous lymphatic vessels, and extends to the serous surfaces, and may spread by contact. There is in nearly all cases a large amount of serous fluid constituting ascites, and it is often discoloured by an admixture with blood"; and he adds, when speaking of the uselessness of treatment in such cases, that "if the fluid is sufficient greatly to distend the abdomen and to press upon the stomach, it may be well to draw it off, but there is great fear that exhaustion may rapidly supervene, and that a low form of peritonitis may be induced."

From this it is plain he never came across a case like mine in which paracentesis was *imperatively* required, and where the symptom of ascites was *the* most prominent and urgent one, and called for repeated tapplings, and where the fluid withdrawn was *like* blood at every tapping. Moreover, the description of the pathological state of the omentum does not tally.

^a Diseases of the Abdomen. Pp. 685-6. 1888.

Dr. Fred. Roberts, as the most recent contributor, writing in "Quain's Dictionary of Medicine," 1894, on the subject of cancer of the peritoneum, states "that it is very rarely found as a primary disease, and equally rarely is it acute; the nature of the cancer in this membrane is generally scirrhus, but may be encephaloid, while the colloid variety is very common." Virchow believes the growth to be sarcomatous.

"The clinical symptoms are very variable and obscure. In some cases large dropsical effusions may be present, so as to interfere with the alimentary canal, and the fluid aspirated is bloody, while abdominal pain is commonly complained of, with tenderness here and there over its surface."

"The diagnosis rests largely upon (1) the presence of a growth, with great enlargement of the abdomen; (2) the percussion dulness does not change readily with change of posture; and (3) the existence of ascites without accumulation of fluid in the flanks or protrusion of the umbilicus."

A review of the cases referred to, and of the opinions of those who have devoted special attention to this subject, cannot fail to impress one with the great difficulties in arriving at an approximate, if not an accurate, diagnosis of peritoneal and omental cancer, and places it among the most difficult in the sphere of clinical medicine. For while the occurrence of sero-sanguineous ascites is doubtless strongly in favour of it, I have shown that similar effusions may occur in cancer of some of the abdominal organs—*e.g.*, the uterus; that cancer of the omentum may occur without ascites, or that if ascites be present it need not be bloody; that the presence of tumours, one or more, which may often be not recognised until after tapping, is a decided aid to diagnosis, but that in the

absence of this aid, where either no tumour exists, or where it is of the soft, diffused character involving a large portion of the omentum and meso-colon, but leaving the colon intact, such as happened in my case, an accurate diagnosis cannot be arrived at without ocular inspection, or tangible evidence as to the state of the peritoneum and the contents of the abdomen.

DR. LITTLE said he had never seen a case of ascites in which there was hæmorrhagic fluid. He had little doubt, however, as to the diagnosis, because they all knew that hæmorrhagic fluid drawn from the thoracic cavity almost invariably indicated a new growth in the thorax. Dr. Finny had drawn attention to one point which he (Dr. Little) wished to emphasise still more, as he thought it of great importance in diagnosis, and that was the character of the urine. He recollected a case of an old lady who was about to be tapped about which he and the President had differed somewhat. He (Dr. Little) caught sight of a vessel under the bed half full of perfectly clear urine, and he, therefore, ventured to say that she had not got cirrhosis of the liver. He then found, on tapping, abundant growths all through the abdomen. He thought that Murchison's observation, that they should always doubt the existence of cirrhosis of the liver unless they saw deeply pigmented urine, was worthy of consideration.

A CASE OF CHYLURIA.

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[Read in the Section of Medicine, December 16, 1898.]

THE occurrence of fat in urine, except in microscopic quantities, belongs to the rarities of medicine. It sometimes does occur in drops or layers visible to the naked eye. This may be due to two classes of causes—(1.) There may be an excessive quantity of fat in the blood, which excess the kidneys attempt to remove by excreting some of the fat into the uriniferous tubes. The fat then appears in the urine. This excess of fat in the urine or hæmatogenous lipuria may occur after fractures of bones in connection with fat embolism. In diabetes, disease of the pancreas, and other morbid conditions, and after the ingestion of large quantities of fat, such as cod-liver oil, the same phenomenon is said sometimes to occur. (2.) There may be some local lesion in the urinary tract which causes fat to appear in the urine. When in microscopic amount this condition is common; we are all familiar with the fat droplets in tube casts in Bright's disease. In cases of fatty degenerations in connection with the urinary tract, whether of tumours or of inflammatory masses, fat has occasionally found its way into the urine in such large quantities as to form drops visible to the naked eye. (3.) In another class of cases there may be both an excessive quantity of fat in the blood, and also fatty degeneration in the urinary organs. This may occur in phosphorus poisoning.

The case which I am about to describe does not belong to any of these groups. In it the fat did not exist in visible

drops, but rather in an emulsion of extreme fineness, and so it belongs to the condition known as chyluria.

Chyluria, then, is that condition in which the urine contains fat in the form of a very fine emulsion. Albumin is also present, and often fibrin, the latter causing the urine to form a jelly, sometimes while still in the bladder, and often after having been passed. This condition of urine, when it occurs, often lasts for very long periods—many years—without seeming to do the patient much harm, unless it be that clotting occur in the bladder, in which case the passage of the clots causes great pain.

The pathology of the disease is in many points doubtful. (1.) A view put forward by C. Bernard and Robin was that there was in these cases an excess of fat in the blood—a lipæmia—and that this excess is excreted by the kidneys. This theory appears untenable. Apart from the fact that such a lipæmia is merely hypothetical, we may observe that when fat is in excess in the blood, and is excreted by the kidneys, as in fat embolism, it appears in the form of drops, and not in a fine emulsion. (2.) Sir W. Roberts records, in his book on Urinary Diseases, an interesting case in which a vesicular eruption formed on the abdomen, and from the vesicles a chylous fluid exuded. For two days chyluria existed. He suggests that a lesion of the mucous membrane of the bladder, similar in nature to that of the skin of the abdomen, and accompanied by a similar oozing of chylous fluid, would fully account for the phenomena of chyluria. This is undoubtedly the case, but it is doubtful whether such a theory can be relied on in any but a very few cases. Not only has such a lesion of the mucous membrane of the bladder never been observed (in Sir W. Roberts' case after death the bladder was found healthy), but the symptoms of ordinary cases of chyluria do not in the least point to any disease of the bladder. (3.) The third view, put forward

originally by Vandyke Carter, is that chyluria is due to some abnormal communication between the abdominal lymphatics and the urinary passages. It is believed that the lymphatics for some reason become obstructed, and that behind the obstruction stasis occurs, and they become dilated and varicose, and that the varicose lymphatics may rupture or weep into the urinary passages. This view is generally accepted. The urine passed is, in fact, exactly what would be formed by a mixture of chyle and urine. In a very interesting case, described and figured by Dr. Stephen Mackenzie, at the *post-mortem* examination the lymphatics at the back of the abdomen were found greatly enlarged, especially those in connection with the left kidney. He thinks the leakage of chyle took place into the urinary tract about the kidneys. In other cases it seems that the leakage was into the bladder. In a case of chyluria in a woman Havilburg obtained healthy urine by catheterising the ureters.

Chyluria is very seldom found except in those who are living or have lived in the tropics—Brazil, India, &c. In these cases the blood always, or almost always, contains some of the varieties of the *Filaria sanguinis hominis*. These parasites in some stage of their life-history probably cause the obstruction in the lymphatics, and so the chyluria.

A few cases, however, have been described in which no filariæ have been found in the blood, and a few are on record in persons who have never been in the tropics. We are quite in the dark as to the cause of the obstruction to the lymphatics in these cases. We are, however, I think, justified in assuming that some obstruction to the flow of chyle and lymph actually exists in the abdomen.

As the disease is a rare one I have prefixed to my notes of the case these remarks on the present state of our knowledge concerning it. The following is the history of the case that came under my care :—

CASE.—Mrs. D.'s father died of sunstroke in India; her mother is alive. There were no brothers or sisters. She herself was born in Mauritius in 1857, but came to England in 1858, and lived at home till 1869. She then lived for two years at Mauritius and one year at St. Helena. She came back to England again in 1872, and soon after, when seventeen years old, married. After her marriage in 1873 she went with her husband to Hong Kong, and lived there three years, coming home, after his death, in 1877. She has lived in Ireland ever since, being engaged as a nurse since 1882.

She had the ordinary children's ailments, but was never seriously ill till, in Hong Kong, she had malarial fever and inflammation of the kidneys. The ague returned occasionally for four months. From that time she was perfectly well till her present illness commenced.

For the past six years she has been head nurse in a workhouse infirmary in Ireland.

In April, 1897, she began to suffer from pain in the lumbar region of the back, "as if she was being chopped in two," for some minutes before she passed water; just before passing it a feeling of pressure and pain was felt about the bladder, and she felt a stabbing or cutting sensation while in the act of passing water. At the same time she noticed her urine milky in appearance. She consulted Dr. Smyly, who advised her to go into hospital, which, however, she was unable to do. Soon afterwards she began to pass clots, which caused intense pain. She told me how a pain would come on in her bladder, and she would go and try to pass water, but she felt as if "there was a wall before her," or as if "there was a barrier in the way." Then, after severe forcing, violent pain would come on, like the passage of a child's head, so bad that she had to scream out, and the bladder would empty itself. When she looked into the vessel she would see a round mass the size of a child's head, milky in colour, or at times streaked with blood. The severe pain in the urethra would persist some time. Usually, however, the urine did not form such large clots in the bladder, and the extreme pain in passing water did not occur oftener than once in a week or two.

This condition lasted till the beginning of April, 1898, when her left leg became swollen, and pitted on pressure. She went into the Rotunda Hospital, when, after a few days' rest in bed, the swelling of the leg disappeared. Nothing calling for gynæcological

treatment being discovered, after three weeks she was transferred to the Adelaide Hospital on May 7th.

I found her a healthy-looking woman, forty-one years of age. She had lost about two stone in weight during the last few years, but otherwise appeared perfectly healthy, except for the condition of the urine. The amount of urine passed was normal; it was acid, and its sp. gr. was 1020–1028. It was sometimes as white as milk when passed, and, on standing, a dense layer of cream rose to the top; sometimes it was merely turbid. There was no periodicity in these variations; sometimes it was clear at night and turbid by day, sometimes the opposite. I could not ascertain that food or fasting, exercise or rest, or change of posture produced any effect upon it. It always contained albumin, but the amount seemed to vary directly with the milkiness, the very milky urine being densely albuminous. Sometimes it was quite fluid, at other times it contained larger or smaller clots. These were like soft blanc-mange or opalescent jelly, but differed in one respect from the clots formed by gelatinous substances. The latter clots are homogeneous; the clots in the urine evidently consisted of a watery fluid held in the meshes of a fibrinous net-work. This difference I noticed from the following observation:—If you let a little thin jelly drop on the floor it will very probably break into pieces, but the pieces will still be gelatinous. If the urinary clot fell on the floor, as it often did when I was trying to get some of it into a bottle, it seemed at once to turn into thin fluid, and the clot disappeared. I suppose the fall shook the fluid out of the fibrinous meshes. Sometimes the clots were pinkish, but usually not.

The urine contained a normal amount of urea; it never contained sugar. Under the microscope nothing whatever could be seen except an emulsion of extreme fineness—so small, indeed, were the fat droplets that under a $\frac{1}{12}$ " oil immersion lens, they only appeared as almost invisible specks. There were no cells or tube casts.

We examined her blood at all hours, day and night, for filariae, but found none. We also in vain examined the clots in the urine.

Under treatment by rest in bed, ordinary food, and a mixture containing perchloride of iron and strychnine, she improved—the urine became less milky, clots ceased to form in the bladder, and on May 24th, after nearly three weeks' stay in hospital, she returned to her nursing duties.

The urine remained quite clear for a month after that. Since

then it is occasionally milky, but she has not passed any clots or had any pain, and she feels very well. She has increased in weight. She is still taking the iron and strychnine, as when she leaves it off she says she suffers from a weary, dragged feeling in her body.

Was this a case of filarial chyluria or not? In favour of the filarial nature of the disease is the fact that she lived both in Mauritius and Hong Kong, places where filariæ abound. The long period of perfect health after leaving Hong Kong and coming home—viz., twenty years—does not disprove this idea. Filariæ rarely do any harm in the body; in some places in the tropics many—in Samoa even 50 per cent.—of the inhabitants harbour them without suffering the slightest inconvenience, and it is only, so to speak, when some accident occurs to the worms that symptoms develop. It is quite possible that my patient may have been infected in Hong Kong, and may have contained the worms for twenty years (Osler mentions a case of chyluria which lasted eighteen years), the parent worms all the time inhabiting the receptaculum chyli, or some of the adjacent lymphatics. Then their death may have caused both disappearance of the embryo filariæ from the blood, and also, by causing inflammation, may have blocked the lymphatics, and so caused their tributaries to become varicose and rupture. “After obstruction of the thoracic duct has been set up by the parent filariæ,” writes Manson,^a “it is of no consequence, so far as the production of an inverted flow of chyle and lymph is concerned, whether the filariæ live or die. A stricture of this description once produced is permanent, and continues after the cause which had given rise to it has long passed away. Hence the occasional absence in chyluria of the embryo filariæ in the blood. In such cases the parent filariæ, after having damaged the thoracic duct,

^a System of Medicine. Edited by Clifford Allbutt. Vol. II. P. 480.

had died." It may, on the other hand, have been that the lymphatic obstruction was brought about by some inflammation or other cause wholly unconnected with the tropics or with filariæ. On this point I cannot form any definite opinion, as I do not think the facts are sufficiently known to elucidate the case.

SIR GEORGE DUFFEY alluded to the fact that some years ago he brought before the Academy a case of chylous ascites. There was a great similarity between such cases and those of chyluria, but he found that there was much difficulty in tracing their causes.

In some cases of chylous ascites, rupture of the receptaculum chyli had been discovered, but, on the other hand, most careful *post-mortem* examination had sometimes failed to show any rupture of the lymphatics, or of the receptaculum chyli.

Charcot and other French observers had described several cases in which there was chronic peritonitis, advancing this as a possible cause of chylous ascites.

DR. KNOTT said that he himself had a case of chyluria under observation at present. The patient was a male, aged fifty-three, a widower. He had had syphilis about five years ago, and gonorrhœa in the early part of this year. Coincident with an eruption of the syphilitic type, he got chyluria, and the specimens of his urine at present were richer in fat globules than even Dr. Bewley's. He could find no trace of the filariæ in the blood. The patient had complained of pain in the lumbar region, and a certain amount of uneasiness, but not actual pain, during micturition. Up to the present, there was no sign of clotting of the chylous urine, such as that described by Dr. Bewley.

DR. PARSONS mentioned a case of ascites in which Dr. Purser, who made the *post-mortem* examination, found the fluid to be perfectly opaque and resembling milk. Shaken up with ether it acted in the same way as the specimens Dr. Bewley had shown this evening, and the microscopical appearances were also identical. Dr. Purser recognised the nature of the fluid, but could not determine the cause. There was nothing to indicate a rupture of the receptaculum chyli. Dr. Purser then suggested that, owing to the increased pressure in the veins on account of the failure of the right side of the heart, the thoracic duct was unable to empty its

contents into the veins, and consequently some of the lymph or chyle became extravasated into the abdominal cavity, and hence the turbidity of the ascitic fluid.

DR. J. W. MOORE said he had searched through records of various urinary analyses made by his father during a long series of years, and he had found only two or three cases in which there was anything approaching a milky appearance of the urine. Of course, at the time these records were taken, the parasitic doctrine of chyluria was not understood, but, as far as he could judge, the patients from whom these specimens were derived, had not resided in the tropics. He thought enough had been said in this discussion to establish the existence of a non-parasitic chyluria, as well as a parasitic form, though most of the cases described in books were, no doubt, due to the *Filaria Bancrofti*. There were fair grounds, however, for supposing Dr. Bewley's case to be due to parasitic infection. The patient's birth in Mauritius, and her subsequent residence in Hong-Kong, would quite justify that supposition.

DR. BEWLEY, in reply, said that Dr. Knott's case seemed to him to belong to a class of cases which Sir W. Roberts in his work on urinary diseases, describes as associated with some kind of eruption on the abdominal walls, and which he (Sir W. Roberts) thought might be due to some kind of lesion of the bladder wall allowing chylous fluid to escape into the bladder.

MERCURY IN DISEASES OF THE HEART.

By WALLACE BEATTY, M.D., F.R.C.P.I. ;

Physician to the Adelaide Hospital.

[Read in the Section of Medicine, December 16, 1898.]

It is interesting and instructive to note how certain remedies, which the keen observers among the physicians of the first half of the present century regarded as of great service in the cure or alleviation of disease, fell into more or less disrepute with succeeding physicians, but are now regaining somewhat of the reputation they had lost. I may mention venesection, antimony, and mercury (in other diseases than syphilis). Thus Osler recommends venesection in cardiac dilatation with cyanosis, and regrets that he has not adopted this treatment more frequently; antimony (tartar emetic) is strongly lauded by Jonathan Hutchinson and Malcolm Morris in acute inflammatory cutaneous affections (I can bear my testimony to its utility in such cases.) It is of the use of mercury in chronic diseases of the heart that I propose to speak to-night. Acute endocarditis and pericarditis do not come within the scope of this communication. It may appear unnecessary in this city to extol the use of mercury in the treatment of diseases of the heart, when one of Dublin's, and the world's, greatest physicians—Stokes—has, in his famous work on diseases of the heart and aorta, borne personal testimony to its immense value. Yet it is at times well to review the extent and limits of usefulness of well-known remedies, and compare one another's observations; and, moreover, I have thought it worth while to bring this subject forward as I have from time to time met physicians who have not

appeared to know the full value of mercury in heart diseases, and in the writings of the present day there does not appear to be sufficient stress laid upon the utility of this drug. Thus, I can find but scanty allusion to the use of mercury in Byrom Bramwell's admirable work on diseases of the heart.

I propose to consider as briefly as I can—

I. The cases in which mercury is of real value.

II. The modes of its administration.

III. The manner in which it acts.

(I.) THE CASES IN WHICH MERCURY IS OF REAL VALUE.

(1) Of all conditions in which mercury is useful the one in which it is most certain to do good is this—general venous engorgement due to chronic primary mitral valve disease. In a typical case there is a rapid, irregular, compressible pulse, physical signs of dilatation of heart, a regurgitant or obstructive mitral murmur, full and pulsating cervical veins, an enlarged, congested liver, high coloured, scanty, and albuminous urine from congested kidneys, anasarca, and perhaps some ascites; in short, all the evidences of back pressure.

(2) The cases of general venous engorgement dependent upon mitral incompetence (relative incompetence) secondary to old-standing aortic regurgitation.

(3) Cases of dilatation of the heart with general dropsy, but yet no obvious valvular disease, there being no murmur and no evidence of kidney disease.

(4) Cases of general venous engorgement from failure of the right heart, caused by severe emphysema and bronchitis.

5. Cases of general venous engorgement due to cardiac dilatation following upon long-continued hypertrophy of the left ventricle, due to chronic interstitial nephritis.

In all these cases there is general venous congestion due to back pressure, and it is in such conditions of the heart that mercury proves most valuable.

(II.) THE MODES OF ITS ADMINISTRATION.

If we select a typical case of general venous congestion dependent on failure of compensation in chronic mitral valve disease, there are four *principal* ways in which we may hope to relieve the heart and remove the congestion.

1. By increasing the power of the heart (*digitalis*, *squill*, *strophanthus*, and *strychnine* are the most generally useful to effect this object). 2. By diaphoretics. 3. By purgatives. 4. By diuretics.

Diaphoresis is of very limited usefulness; in severe cases the patient has orthopnoea, and the administration, *e.g.*, of hot air baths to cause sweating is not readily manageable. *Pilocarpine* is a depressing and sometimes dangerous remedy. The depression likely to ensue from diaphoresis, and especially the fact that it can at most only give very *temporary* relief to the loaded veins, are limits to its possible usefulness. With regard to purgatives: If the patient is strong it is well to commence treatment by free purgation, and repeat the purgation every two or three days. Many patients are, however, too weak to bear purgatives, and we must then rely upon cardiac tonics and upon diuretics. The advantages of diuretics are—their action is *continuous*, and is not attended with the depressing effect which follows upon diaphoretics or purgatives. Our main reliance must, therefore, be placed upon heart tonics and diuretics—in both the action is continuous.

I leave out of consideration such special treatment as bleeding, puncture, &c.; also the questions of rest, diet, stimulants, as my object is to dwell solely upon the uses and action of mercury.

Mercury is administered in heart disease for both its purgative action and its diuretic action.

Most physicians use mercury in purgative doses or combined with other purgatives, giving it occasionally in the course of other treatment. It is thus mercury is adminis-

tered by Sir William Broadbent. He writes^a—"With venous obstruction the liver will be enlarged and greatly congested, perhaps pulsating, and one of the first objects of treatment is the relief of the engorgement of the liver. The best results are undoubtedly to be obtained, according to my experience, from purgatives, in which calomel or other mercurial preparation is a constituent—such as calomel and compound jalap powder, calomel, blue pill, or grey powder with colocynth and hyoscyamus, followed or not by salines. Hydragogue cathartics of greater violence may be necessary in some cases, but the effect on the liver and heart is not proportional to the degree of purgation, and the relief of the dropsy is not due simply to the amount of liquid carried off by the intestinal surface, but is frequently the effect rather of the diuresis which follows improvement in the circulation. *Digitalis* is often useless, and appears only to add to the embarrassment of the heart, and to produce sickness until the way has been cleared for its operation by a mercurial purge, and when its good effects on the heart seem to be expended a fresh start will often follow a calomel and colocynth pill."

Again, Sir William Broadbent, writing on the treatment of dilatation,^b observes—

"Calomel or blue pill or grey powder should be given in doses of from 1 to 5 grains, according to the urgency of the case, with colocynth and hyoscyamus or rhubarb, followed by some mild saline. After one or more full doses at the outset a moderate dose may be given every second or third night."

Mercury may be administered almost or exclusively for its diuretic action, in small doses frequently repeated, and this is the method which has proved most successful in my hands. The plan I adopt is as follows:—I give a pill containing half

^a Heart Disease. P. 108.

^b Heart Disease. P. 264.

a grain of calomel usually along with digitalis and squill, every four hours night and day, for from 10 to 14 days. If these pills should tend to cause purgation I give them combined with opium. I commonly order two sets of pills—one set containing calomel half a grain with squill and digitalis, the other set containing the same together with one-eighth to half a grain of powdered opium. The nurse is directed to give a pill every four hours either with or without the opium, according to circumstances; one or two motions in the 24 hours is all I think well to allow. It often happens that very few or even no opium pills are needed during the period of the administration of the mercury. After 5 or 6 days an improvement in the condition of the patient generally shows itself, or, if not so soon, in about 8 days, when free flow of urine, as much as 100 ounces in the 24 hours, and a concurrent subsidence of the dropsy manifest themselves. In the next few days the symptoms of general venous engorgement diminish rapidly. At the end of about 14 days the gums may be a little sore; I then stop the mercury and order iron (generally citrate of iron and ammonia) combined or not with digitalis, according to the condition of the pulse. Once the dropsy has disappeared entirely or almost entirely, the amount of urine secreted falls to, or almost to, the normal. This method of administering mercury, relying on its diuretic action solely, is specially useful in feeble patients, who would be exhausted by frequent purgation, and though at the end of a mercurial course some patients may feel weak, they will be relieved of their distressing symptoms, and after some days' use of iron, &c., the strength rapidly returns. This treatment may be repeated again and again every now and then when recurrences of general venous congestion manifest themselves, and again and again complete relief of longer or shorter duration may be obtained. In this connection I may mention the case of a lady who was under my care several years ago suffering

from mitral regurgitation, enormous dilatation of the heart, and general venous congestion, with very marked anasarca. I treated her for several days with Baillie's pill (blue pill, squill and digitalis), and was disappointed to find no improvement in her condition. Dr. Head then saw her with me. He remarked, "For this case blue pill is too slow; change it to calomel." After a few days treatment with calomel the dropsy disappeared, and a course of iron was followed by some weeks of comparative ease; she was able to go out on fine days. Again and again when the circulation became embarrassed the mercurial course was resorted to, followed by a course of iron and digitalis, and again and again the treatment was followed by relief. She lived for about two years. It is interesting to note that the marked dropsy of the lower extremities which was present in her first attack never recurred, but the back pressure was almost entirely directed into the liver, which, with each attack, became swollen to an enormous size.

One other case I may allude to. An old gentleman of about 80 years of age, suffering from mitral regurgitation with enormously dilated heart, who had been treated with digitalis, occasional purgative doses of calomel, and nightly hypodermic injections of morphia, was completely relieved of his symptoms for a time by a course of calomel given every 4 hours. He lived for about 2 years, and never again required morphia for rest and sleep at night. Every now and then he resorted to the calomel course.

In this case the complete relief afforded by a course of frequently-repeated doses of calomel, contrasted with the failure of occasional purgative doses, was very remarkable.

We may, of course, meet with some cases in which mercury is not well borne, but these are very exceptional: of course a time comes when mercury fails.

The state of the pulse will determine whether mercury is to be given alone or in conjunction with digitalis and

squill; most commonly it is best given in combination, and mercury would appear to act as an adjuvant to digitalis, the action of the digitalis being aided by the diuretic effect of mercury. Dr. Little, in his lecture on "The Resources of the Physician in the Management of Chronic Diseases of the Heart," writes—"If we were compelled to have only one remedy (in cardiac dropsy) I have no hesitation in saying that remedy should be the old-fashioned pill of blue pill, squill and digitalis, yet I think sometimes one and sometimes another of the ingredients in the time-honoured Baillie's pill is unnecessary." And again, "As a rule, we may say: that when the liver is greatly swollen calomel or blue pill is required, with digitalis if the pulse is frequent and irregular, without digitalis if the pulse is not frequent nor irregular."

In the *Lancet* of Sept, 28th, 1895, p. 779, Dr. William Murray, of Newcastle-on-Tyne, extols the use of mercury in heart disease, and illustrates his remarks by a notable case.

The beneficial effect of mercury in heart disease is thus graphically described by Stokes—"I do not wish it to be believed that by mercury we can cure dilatation of the heart, but many years' experience has convinced me that by the use of this remedy we can delay its production, remove the irregular action which assists in causing the disease, and, above all, prolong the patient's life, and, again and again, relieve him from dropsy, and from pulmonary and hepatic congestion, even when they have arrived at a point which threatens a speedy dissolution." And again in describing the action of mercury in patients suffering from general venous congestion from heart disease—"Under all these terrible symptoms it happens again and again that the exhibition of mercury will, as by enchantment, remove the anasarca, reduce the hepatic tumour, restore the heart to its ordinary, though not its normal, condition, and for a period of time,

more or less long, enable the patient to pursue the avocations of an active and laborious life."

Mercury acts well in the other conditions mentioned in the early part of this communication, and I prefer generally to administer it in the same way as in primary mitral valve disease with general venous congestion. I need not allude to the treatment of these conditions, except to the cases of dilatation of the heart secondary to hypertrophy of the left ventricle which occurs in chronic Bright's disease. When the heart begins to fail and dilatation occurs in chronic interstitial nephritis, and the symptoms of general venous congestion from back pressure make themselves manifest (a desperate case indeed), mercury often acts extremely well, and though one cannot look forward with the confidence that one may in primary cardiac disease to a good result, still a temporary good result often is effected. In this complication of Bright's disease mercury is certainly not contraindicated.

(III.) THE MANNER IN WHICH MERCURY ACTS.

Clinically the good effect of mercury in cardiac disease is recognised by a copious flow of urine, with concurrent disappearance of the dropsy, but how this diuresis is brought about is still a matter of conjecture. If we study the action of diuretics we find that they act mainly in one of three ways:—

1. By increasing the force of the left ventricle, and so increasing the pressure in the renal arterioles.
2. By dilating the afferent arterioles of the kidney, and so bringing more blood to the kidney, with consequent increased secretion.
3. By stimulating the renal epithelium to increased secretory activity.

We know that mercury stimulates the salivary glands; it is probable that a similar action of mercury on the renal

epithelium partly accounts for the increased secretion. Yet this does not appear to explain fully the action of mercury in cardiac dropsy, as it is a notable fact that the remarkable increase of secretion which is brought about by mercury in cases of cardiac dropsy (amounting to a flow of 80 to 100 ounces or even more of urine in the 24 hours) only continues as long as there is dropsical fluid to be absorbed. Mercury may, therefore, act by increasing the activity of absorption, and so the diuresis which follows may be simply the removal of the excess of fluid re-absorbed. However, from the circumstance that the back pressure from the heart must be felt not only by the veins but by the lymphatics, which eventually open into the veins, the circulation through the absorbing lymphatics must be largely interfered with; therefore the probability of the action of mercury being *exclusively* one of stimulating absorption is hardly likely. If mercury acts both by increasing the activity of absorption and at the same time increasing the activity of renal secretion its good effect in cardiac dropsy can be partly understood.

But the action of mercury on the liver must also be taken into account.

Sir William Broadbent explains the good effect of mercury in heart disease by its action on the liver. He writes^a—"Mercurial purgatives have the effect of diminishing arterio-capillary resistance and of lowering arterial tension, and therefore of relieving the heart. The hypothesis by which it seems to me it is best explained is that mercury influences the liver chemistry and promotes the elimination of impurities which when retained in the blood give rise to resistance in the capillaries. Mercurial purgatives then have the double effect of depleting the portal system while resistance in the capillaries. Mercurial purgatives, then, the right side of the heart, and of diminishing the resist-

^a Heart Disease. . P. 263.

ance in the peripheral circulation and so relieving the left ventricle of stress."

This hypothesis is a very plausible one, but a difficulty I find in its acceptance is that in a large number of cases in which the good effects of mercury are observed the pulse is both small and very compressible; no evidence of arterial resistance.

In conclusion, I do not wish to be understood to advocate mercury in every case of mitral valve disease with symptoms of imperfect compensation. In many cases occasional resort to digitalis and other cardiac tonics is sufficient to restore the deranged circulation; but when digitalis and other cardiac tonics fail, the use of mercury is often attended with the happiest results.

I have dwelt, accordingly, at length upon the action of mercury in chronic heart disease, because I wish to bear my testimony to its immense usefulness, and because I wish to emphasise the fact that while in some cases it may be administered with advantage in occasional purgative doses, in a large number it is best and most successfully given in small, frequently-repeated doses for about a fortnight at a time, with the object of causing free diuresis, any tendency to purgation being kept in check by combining the mercury with opium.

DR. BEWLEY said that Dr. Beatty's paper had induced him to think that there was nothing absolute in medicine, since he was previously taught that in cases of Bright's disease the worst thing the physician could do was to administer mercury, and also that opium was undesirable in the same disease.

DR. MARTLEY said that Sir W. Broadbent's teaching was that a good purge of calomel would clear the kidneys, and put them into working order by lowering the general venous pressure.

DR. LANGFORD SYMES related a case of a lady who, some years ago, used to have periodic attacks of cardiac dyspnoea, anasarca, and other evidences of cardiac lesion. After trying other remedies

she was eventually treated almost exclusively with calomel, and since then, which was nearly four years ago, she had never had a recurrence of the disorder.

DR. J. W. MOORE drew attention to the fact that it was doubtful whether mercury in the form of calomel, blue pill, &c., had any direct action on the liver at all. It was on the duodenum that it acted, and it unloaded the liver by sweeping the bile through the duodenum—that is to say, it had only an indirect action on the liver.

DR. BEATTY, in reply, said that when he commenced to practise he had the same dread of morphin and mercury in Bright's disease as Dr. Bewley. With reference to the larger doses of calomel, which he was told Sir W. Broadbent employed, he recalled one case in particular where calomel was given successfully in purgative doses when small doses had not succeeded. It seemed strange that when they got patients well once with mercury that they continued well for a considerable time, and Dr. Stokes had drawn attention to this point in his work on heart diseases.

INNOMINATE ANEURYSM.

By JAMES CRAIG, M.D.;

Physician to the Meath Hospital.

[Read in the Section of Medicine, December 16, 1898.]

THE case which I desire to bring under the notice of the Academy is that of a gentleman who suffered from an aneurysm of the innominate artery, which has become entirely quiescent after a long period of marvellous patience and dogged perseverance in carrying out the principles of treatment by rest, a moderate quantity of food, and large doses of iodide of potassium.

To Dr. Little, who is his usual medical attendant, I am indebted for permission to relate the case.

CASE.—The patient, aged sixty-five, has been twice married, is the father of five children, two of whom are the product of his second marriage. He has suffered as long as he can remember from bilious attacks, which he considers to be of a gouty nature, and accordingly, in treating them as such, he has been for many years a disciple of the vegetarian school of dietary and a patron of all that wide class of non-alcoholic beverages which goes by the name of mineral waters. He is positive that he never contracted syphilis. During a number of years past he has spent from six to eight weeks annually at one or other of the Continental spas, notably Carlsbad and Marienbad. He has led a busy life since his youth, for after a short career as an apothecary's assistant and as a medical student, he then settled down to make money, and in this praiseworthy avocation he has been eminently successful. The knowledge of therapeutics which he acquired in his younger days formed an unstable basis on which he has ever after been attempting to build a fabric of medical lore, so that one might perhaps truthfully suggest that *here* the little learning had indeed become a dangerous thing. He reads his *British Medical Journal* more assiduously than his Bible, and no volume of modern fiction could arouse in his mind

a fraction of the interest which a treatise on aneurysm or diet calls forth.

I mention these facts because in the management of the case one had to give reasons for everything that was done, and endeavour to lay to rest a spirit of pedantic theorising which is never helpful to recovery in any form of disease.

Physically he is spare, looks older than his years, but is remarkably energetic. His face is of a dull yellowish-grey colour, and suggests a nervous temperament.

He has been subject to constipation since his boyhood, and he attributes the actual cause of the aneurysm to the violent straining efforts he forcibly induced in order to secure a motion from the bowels on June 11th, 1897. That night he felt a pain in his chest, for which Dr. Little was consulted three days subsequently. The latter saw him on several occasions at this time, which was just on the eve of his summer holiday, but no manifestations of aneurysm had then made their appearance. On June 23rd Dr. Raverty, of Bray, who had been his family attendant in the country, was called in, and believing that the signs of an innominate aneurysm were presenting themselves he called to his aid Mr. Wheeler's skill, and the latter confirmed his diagnosis, but deemed any operative interference to be inadvisable. Iodide of potassium, morphia, trinitrine, and calomel were ordered. A week later—on June 30th—I saw the case with Dr. Raverty, who, at the patient's own request, transferred him from that date to my care. I concurred at once in the diagnosis, but at the same time expressed a fear that the arch of the aorta itself was also dilated on account of the manner in which the right carotid and subclavian arteries were pushed upwards.

On Inspection there was a distinct pulsating tumour pushing forwards the right side of the manubrium sterni, the second right costal cartilage, and the inner end of the right clavicle, which, indeed, was partially luxated in a forward direction. The superficial veins in this region were distended as well as the veins in the right side of the neck and in the right arm. The right subclavian artery was visibly pulsating above the clavicle.

On Palpation the expansile character of the tumour was conveyed to the hand, and a thrill could be detected. The right radial pulse was somewhat smaller and appreciably later in time than the left. There was no tracheal tugging to be felt.

On Percussion a dull note was elicited over the seat of the

tumour, and it extended for an inch to the right of the manubrium sterni, and an inch and a half downwards in a vertical direction from the right sterno-clavicular articulation.

Auscultation revealed a systolic bruit over the seat of the pulsating tumour.

He complained of a throbbing sensation in his chest and neck, as well as violent pains of a more or less spasmodic nature which radiated from the upper part of the thorax towards the neck, the back of the head, and down the right arm. He was fidgety, sleepless, and excitable. His tongue was coated, his pharynx was painful and congested, his voice at one time was weak and at another hoarse. He lay day and night in bed between woollen rugs, and was clothed in warm combinations, long stockings, and a dressing gown.

I increased the iodide of potassium to 20 grs. thrice daily, applied three leeches at once and subsequently ice bags to the tumour; ordered a draught of chloral hydrate and bromide of potassium to procure sleep and to counteract the restlessness. He refused point blank to make use of any meat, so his diet was fixed at about two pints of fluid nourishment in the 24 hours, consisting chiefly of milk and gruel, with pellets of ice to relieve thirst, and a liberal supply of grapes and ripe pears or other fruit.

Sir. C. Nixon and Sir Wm. Stokes saw him with me in the course of the next fortnight, and they entirely agreed in the diagnosis and treatment, except that Sir Wm. Stokes suggested $\frac{1}{4}$ gr. hypodermic injections of morphia to be administered at night in place of the draught of chloral.

I need not weary the Academy with all the varying details of the case during the months of July and August. The morphia was stopped at the end of four weeks. The pulse was carefully watched, and although it became at times both irregular and intermittent and greatly increased in rhythm on the slightest exertion or excitement, its usual average was 74. At intervals, when the pulse became continuously rapid or a crop of acne spots appeared on the skin, the iodide was stopped. Occasionally the temperature went up to 100° or 101° F., but more usually, when a feverish state was complained of, it was found that the thermometer registered a

subnormal range. Once under great persuasion he partook of an ounce of roast chicken, and the result, according to his own account, was most injurious.

Marienbad salt was taken early every morning and was followed in a few hours by one or two fluid evacuations from the bowels. About the middle of August, and then for several days in succession, the tumour showed signs of quiescence, but the pulsation again became vigorous and dashed our hopeful expectations to the ground.

Towards the end of the month, however, I was satisfied that the tumour had become distinctly smaller, although the pulsation had not disappeared. I had arranged to leave town on the 1st of September in order to spend a fortnight in the country, and on several occasions before my departure he was moved to a lounge chair, where he remained for a few hours at a time. This was done because he had all along insisted that he must betake himself to the Riviera in the middle of September, and I had promised that in order to prepare him for the journey he should be allowed to sit up at the termination of two months in bed, whether or not solidification had taken place in the aneurysm. During my absence he was still to continue the treatment as before, but was to be lifted on to a rocking chair and remain there for a few hours daily.

I did not see him again after my holiday, but Dr. Little, who had returned to town in the meantime, saw him before he started for Monte Carlo on the 17th of September. Dr. Little then ordered him a mixture containing chloride of calcium and advised the application of small blisters over the seat of the tumour. The chloride of calcium was persevered in at intervals for a period of only three weeks, because, as the patient subsequently explained to me, "although it seemed to solidify the aneurysm it raised the arterial tension."

He remained at Monte Carlo for three months and during all that time his programme was unvarying, and carried out according to his own specific directions as follows :—

Diet—One pint of milk flavoured with coffee was partaken of four times a day, with a roast apple as a second course on each occasion.

Medicine—From 15 to 30 grs. daily of iodide of potassium were taken in milk, and a dose of Marienbad salt was the unfailing laxative used each morning.

General—The entire day was spent in the garden of the hotel in a comfortable American rocking chair with a long back and a long seat, and to this place of rest he was carried from his room in the morning and back again at night, so that walking was not attempted.

During these months he considers he got gradually free from all the symptoms.

At the beginning of the present year he went to the Italian Riviera and here he began to walk about. In February he paid a visit to Dr. Little, who was then in Nice. Later on he migrated to his beloved Marienbad, where he indulged in plenty of walking exercise and became less abstemious in regard to his food, and here, too, he felt free from all his troubles, although he still continued to use the iodide of potassium.

He returned to Dublin during the autumn, and in November last, 18 months after the onset of his symptoms, I put him through a careful examination, and unless for a slight prominence and diminished resonance where the tumour had existed there was absolutely no physical signs of an aneurysm to be found. He looks older and has acquired a slight stoop in walking, otherwise he is in excellent health and spirits, has increased in weight, and is capable of the average amount of physical exertion. In

his pocket he carries small phials of iodide of potassium in solution, and as the spirit moves him he swallows a dose, just as if it were the elixir of life.

DR. W. J. THOMPSON, speaking of the use of chloride of calcium in the treatment of aneurysm, said that a patient was admitted into Jervis-street Hospital some years ago suffering from aneurysm of the arch of the aorta. She was put on large doses of chloride of calcium (20 grs. three times a day), due care also being taken to secure absolute rest. After remaining in hospital for about six weeks she left, the aneurysm having then diminished considerably in size. She returned twelve months afterwards with the aneurysm back again to its original size, and was once more treated successfully with chloride of calcium. She then left once more, and died on her return this year. On *post-mortem* examination two sets of fibrin deposits were found in the aneurysm, the first evidently corresponding to the first time she was in hospital, and the second to the second time in hospital.

DR. CRAIG, replying, said that with regard to Dr. Thompson's case, he thought that the two layers of fibrin within the sac of the aneurysm were accounted for by the fact that the patient got two periods of rest.

CASE OF ULCER OF OESOPHAGUS.

By JAMES ALEX. LINDSAY, M.A., M.D., M.R.C.P.:

Physician to the Royal Hospital, Belfast.

[Read in the Section of Medicine, March 10, 1899.]

CASE.—John C., traveller, aged fifty-nine, was admitted into the Royal Hospital upon Feb. 7, 1899. He had an attack of "blood-poisoning" twenty years ago, but otherwise had enjoyed excellent health. For some time past he had been suffering from pain in both lumbar regions, to which he did not pay much attention. During the first week of Feb. he had taken a good deal of drink; his appetite had been impaired, and the bowels rather relaxed. At eight o'clock a.m. on Feb. 7 he took 14 drops of laudanum; at ten o'clock a.m. he drank a bottle of stout, and was suddenly seized with severe pain in the epigastrium and vomited. He came to hospital at eleven o'clock and was admitted.

On admission the temperature was found to be 100° . The patient complained of pain in the epigastrium; the general condition was fairly good; the urine was found to contain a large quantity of sugar and a little albumen, and there were signs of effusion into the right pleura; the respirations were hurried; the abdomen was slightly distended and tender on palpation in the epigastric and in both lumbar regions.

The patient's condition throughout the day did not undergo any material alteration. Towards midnight his state began to change for the worse. For the first time a slight swelling was observed in the left eyelids, which proved to be subcutaneous emphysema. In a short time the eyelids became much distended, the eye completely closed, and the emphysema quickly invaded the left side of the face and neck and the upper part of the chest, extending slightly across the middle line to the right side. The pulse was 120, weak and irregular. The respirations were 56. Patient complained of pain in the abdomen and of feeling very weak.

The diagnosis presented great difficulties. We had to seek an explanation for sudden abdominal pain and vomiting, coming on after drinking a considerable quantity of fluid, followed after an interval of about fourteen hours by rapidly-developing superficial

emphysema of the left side of the face, neck, and chest; and to complicate the case still further, we had sugar and albumen in the urine, and a large effusion into the right pleura. The possibility of a gastric ulcer rupturing through the diaphragm into the lung was considered. This rare accident is known to occur in cases of gastric ulcer in which adhesion has taken place between the stomach and the diaphragm. As this diagnosis seemed to leave several points unexplained, and as the patient's history did not point in any conclusive way to the presence of ulcer, no positive opinion was arrived at. The bowels were opened by enema; a sedative was administered, and it was decided to watch the case for the present. The indications seemed too obscure to justify operative interference.

The patient passed a restless night, and the following morning his condition was in most respects the same, but there was increasing weakness. He gradually sank during the day, and died at 11 o'clock p.m., thirty-seven hours after drinking the bottle of stout, and twenty-three hours after the first appearance of emphysema of the face and eyelids.

The autopsy was made by Dr. Lorrain Smith twenty-two hours after death. I am indebted to Dr. Smith for the following notes:—Emphysema was well marked in both mediastina, especially the left. The right pleural cavity contained 50 ozs. of fluid and the left 16 ozs. The fluid was flocculent serum, not purulent. Well-marked signs of acute pleurisy on both sides; lungs congested; no consolidation. Two inches above the cardiac orifice of the stomach there was an elongated ulcer, an inch and a half long, in the œsophageal wall. In the lower part of its extent it involved only the mucous membrane. The edges of the ulcer were thickened, but not indurated. There was no evidence of any malignant deposit around the ulcer or elsewhere in the œsophagus, and no secondary deposits in any of the viscera. A sinus connected the ulcer with an abscess in the posterior mediastinum between the œsophagus and the aorta. This abscess had ruptured into the lung at its root, and air had been extravasated along the deep fascia, and also along the superficial fascia of the neck. There was no communication between the abscess and the pleural cavity. A few patches of atheroma were found in the aorta. The kidneys were much congested, and the liver was fatty. In the brain there was chronic thickening of the pia and arachnoid. There were patches of atheroma in the arteries of the base, general congestion of the meninges, and œdema of the brain sub-

stance. The amount of fluid in the ventricles was increased, and the puncta cruenta were well marked. The pancreas was normal.

As to the cause of the ulceration of the œsophagus, it may have been syphilitic. There was no history of swallowing a foreign body or any corrosive fluid, but at the age of thirty-nine the patient had an attack of what he called "blood-poisoning." It seems probable that this was really syphilis, and that the ulcer had its origin in this way. There were no definitely syphilitic lesions found at the autopsy. The *post-mortem* evidence was decidedly against the hypothesis of malignant disease.

It is interesting to observe that the emphysema was first noticed in the eyelid.

DR. FINNY said he could not understand how mediastinal emphysema could reach the eyelids, though, of course, there were records of emphysema of the eyelids from rupture of the air passages.

DR. HAYES related the case of a young man dying of rapid general tuberculosis, who two days before death complained, after drinking some milk, of intense pains over the sternum. An autopsy showed the extravasation of milk surrounding the œsophagus, which had two ruptures about half-way down.

DR. COLEMAN referred to the case of a boy who, after swallowing a large fish bone, developed not only pus, but also air in pericardium, due, no doubt, to the fish bone ulcerating through the œsophagus. He believed that the gas in the pericardium was due to decomposition, and this was also a possible explanation of the emphysema which was present in Dr. Lindsay's case.

DR. LINDSAY replied.

PROBABLE TUBERCULAR MENINGITIS.

By JAMES ALEX. LINDSAY, M.A., M.D., M.R.C.P.;

Physician to the Royal Hospital, Belfast.

[Read in the Section of Medicine, March 10, 1899.]

CONSIDERABLE doubt exists in the minds of many members of the medical profession regarding the possibility of recovery in tubercular meningitis. A long list of leading authorities—British, American, and foreign—might be quoted in support of the view that recovery never takes place, and that all cases of alleged recovery involve an error of diagnosis. On the other hand, Gowers says, “It is not open to question that cases do sometimes recover.” Fagge and Bristowe held the same view, and although Osler has not himself seen a case of recovery, he admits that such cases have been reported by good authorities. While the subject remains in this doubtful state it is desirable to put on record every case in which recovery takes place after the diagnosis of tubercular meningitis had been made upon apparently adequate grounds.

CASE.—Miss E. G., aged nineteen, was seen by Dr. King Kerr upon Nov. 20, 1898, when he found a considerable effusion into the right pleura. The family history was bad, there being tubercle on both sides of the house, and the mother and a younger sister being at the present time actual sufferers from phthisis. The patient had enjoyed fair health, but had suffered much from periodic headache. A few years ago some tuberculous glands were excised from the neck, the scars remaining, but perfectly healed. There was no reason to suspect the existence of any antecedent pulmonary disease, but the pleurisy had come on insidiously, and may have been tubercular in origin. The temperature upon Nov. 20 was 103° , and the pulse 96.

The case pursued a slow but not unfavourable course until Dec. 3, when the patient first complained of headache. The previous

night had been restless, and the temperature, which had fallen to 99° , now rose to 101° . On the following day, Dec. 4, the headache was exceedingly severe, and towards evening vomiting set in. The night was very bad, and on the following morning, Dec. 5, the headache was severe and continuous, vomiting frequent, the tongue thickly coated, the temperature 101.5° , pulse 96. At 4 30 o'clock p.m. on this day I first saw the patient in consultation with Dr. King Kerr. She was extremely restless, tossing about continuously in the bed, and apparently in great suffering. The pulse was frequent, regular, and of low tension. The pupils were very sluggish, but neither much contracted nor dilated. There was still some fluid in the right pleural cavity. On the following day, Dec. 6, the symptoms were still more severe. The patient was delirious, and was with difficulty held in the bed. The temperature was 101° in the morning, and rose to 102° in the evening. *Tache cérébrale* was well marked. The pupils were moderately dilated, and responded very feebly to light; vomiting still continued. An examination of the fundi oculi with the ophthalmoscope showed the presence of double optic neuritis, and the retinal vessels were dilated and tortuous. These signs were rather more marked on the left than on the right side. Late on the night of Dec. 6 the patient became comatose, and began to pass all evacuations involuntarily. On the following day, Dec. 7, the patient was comatose, but showed slight signs of consciousness if addressed in a loud voice. The temperature fell at night to 100° , the pulse remained frequent, regular, and weak. The pupils were much dilated and very sluggish. The patient continued able to swallow her milk. The evacuations continued to be passed involuntarily. This condition lasted from Tuesday, Dec. 6, to Friday, Dec. 9, without substantial change. The patient was seen several times daily by Dr. King Kerr, and each afternoon we met in consultation, only the slenderest hope of recovery being entertained. On Friday, Dec. 9, the coma showed signs of abating. The next day there was some further improvement, and upon Sunday, Dec. 11, the change for the better was marked. From this time forward the patient made an uninterrupted recovery, and in about three weeks had regained her ordinary health. During convalescence she complained of persistent vertical headache, which only disappeared slowly and by degrees. The fluid in the right pleural cavity gradually became absorbed.

The treatment adopted consisted in the continuous application of cold to the head by means of Leiter's tubes, the internal adminis-

tration of iodide and bromide of potassium, and the occasional employment of a mercurial purge.

It will, I think, be admitted that this was at least a case of meningitis, whether tubercular or not. The possibility of any alternative diagnosis, more especially of typhoid fever, was carefully considered, but was clearly inadmissible. The temperature was not in the least like typhoid; there was no rash, no enlargement of the spleen, no diarrhoea; the tongue was not typhoid in character.

In favour of the meningitis having been tubercular we have a quite unusual combination of evidence—the family history, the previous existence of tuberculous glands in the neck, the presence of a suspicious pleurisy all point in one direction. It is noteworthy that no slowing of the pulse and no paralysis of any of the cranial nerves appeared. The absence of any pressure symptoms justified a hope of recovery, which was never quite abandoned, and which was finally justified by the result.

DR. DRURY said that the frequent pulse, regular throughout, the rather high temperature, the absence of strabismus or any form of paralysis, and the involuntary passage of the evacuations, led him to believe that it was not tubercular meningitis. He suggested that it was a case of rheumatic pleurisy with some rheumatic meningitis.

DR. FINNY said he had very great doubts that it was a case of tubercular meningitis. He thought that many of the cases condemned as tubercular meningitis may really be ordinary meningitis.

DR. KNOTT said that tubercular meningitis as a primary and uncomplicated disease occurred very rarely. In children it was nearly always a part of general tuberculosis.

DR. R. TRAVERS SMITH asked whether the choroid coat of the eye had been examined for the presence of tubercle.

DR. J. W. MOORE thought as cases of tubercular peritonitis could recover without operation so might tubercular meningitis. He suggested that they should try the tuberculin test in these cases, but he believed that both pleural effusion and the head symptoms were possibly due to the micro-organisms of pneumonia, which sometimes produced a very dangerous form of meningitis.

DR. LINDSAY, in reply, said that DR. MOORE's suggestion of pneumonia had also occurred to him. Tubercles were not found in the choroid, but the patient was so restless that the examination of the eye was accomplished with difficulty.

CASE OF NON-FEBRILE PNEUMONIA.

By JAMES ALEX. LINDSAY, M.A., M.D., M.R.C.P.;

Physician to the Royal Hospital, Belfast.

[Read in the Section of Medicine, March 10, 1899.]

CASE—S. M.F., aged thirty-three, male. *Family History* good; both parents living. *Personal History*—No previous illness of any importance; habits very intemperate.

History of Case—On Thursday evening, Oct. 13, 1898, patient consulted Dr. M'Kisack. He complained of having suffered from headache, sickness, abdominal pain, and malaise for several days. The tongue was covered with a creamy white fur, the breath was foul; pulse 80, temperature 98.8° , respirations 20. No abnormal signs in chest or abdomen. The patient passed a fair night and next morning, Friday, Oct. 14, he was again sick and vomited after breakfast. Temperature normal, tongue still dirty. Dr. M'Kisack again examined the chest, but did not find anything abnormal. On Friday afternoon the patient felt better and sat for some time in the dining-room and talked with several visitors. At 9 p.m. it was noticed that his breathing was hurried, and he had some difficulty in going upstairs to bed. He passed a restless night. Dr. M'Kisack saw him again at 9 o'clock a.m. on the following morning, Saturday, Oct. 15, when a marked change in the general condition was manifest. The respirations were now 36 per minute, the pulse 100, temperature in the mouth and in the groin 96.5° . Signs of consolidation of the base of the right lung were now manifest—viz., dulness on percussion, bronchial breathing, and increased vocal fremitus. I saw him in consultation with Dr. M'Kisack at 4 o'clock p.m. on this day. In addition to the above signs there was some crepitus audible over portions of the lower lobe of the right lung. The pulse was 106 in the minute and very weak; temperature in the groin 98° , in the rectum 99° ; respirations 36. The patient was much collapsed, but quite conscious. The condition being evidently one of the utmost gravity the relatives were telegraphed for and arrived in a few hours. The

patient got rapidly worse. At 8 o'clock p.m. the temperature for the first time began to rise, and reached 101° . The patient quickly sank and expired at 9 30 o'clock.

The points worthy of note in this case are the following:—

(1) The obscure onset, the symptoms at first being purely gastrointestinal and probably connected with the patient's alcoholic habits. (2) The absence of pyrexia until within a very short time of death, in spite of the presence of a considerable amount of consolidation of the right lung. (3) The absence of any reaction, the patient rapidly sinking under the pneumonic attack. In this collapse no doubt alcoholism was a chief factor. (4) The fact that death ensued within twenty-four hours of the definite onset of pulmonary symptoms.

The treatment included the administration of carbonate of ammonia, digitalis, strychnin, and alcohol, together with inhalations of oxygen, but proved wholly ineffective.

The immediate cause of death in the above case may admit of some doubt. The signs were more those of general collapse than specially those of heart failure, which is, I believe, the usual cause of death in pneumonia. In many cases death is preceded by evident signs of failing heart, but is very sudden at the end. In these cases the right ventricle is often found full of soft whitish clot. Possibly plugging of the pulmonary artery may sometimes be the determining cause of death.

Into the general treatment of pneumonia it is unnecessary for me to enter. I rely chiefly on strychnin, alcohol, and inhalations of oxygen. My early experience of oxygen was disappointing, and at one time I was disposed to take a low view of the value of this remedy. Recently I have been more fortunate, and believe I have seen substantial benefit from its administration. No doubt the benefit is often transient, but in an acute self-limited disease like pneumonia every moment gained is a substantial advantage to our patients.

DR. J. W. MOORE said there was nothing new in the apyrexia. The new doctrine about the production of pyrexia was that it depended upon the effect on the central nervous system of the albumoses developed by the action of the poison, whereas the ptomains produced the other head symptoms. It was possible that the action of the albumoses had an opposite effect in certain cases,

and produced collapse. He considered that the hypodermic administration of strychnin was one of the best remedies in the collapse of all fevers.

DR. COSGRAVE mentioned a case of pneumonia in which the temperature remained subnormal throughout. He had tried hypodermics of strychnin, but they had had no effect.

DR. LINDSAY, in reply, said he always gave strychnin in these cases.

MORPHINOMANIA.

By HENRY C. DRURY, M.D. (DUB. UNIV.), F.R.C.P.I.;

Assistant Physician Sir Patrick Dun's Hospital;
Physician, Cork-street Fever Hospital.

[Read in the Section of Medicine, March 10, 1899.]

THE morphia habit, or morphinomania, as it lately had been styled, is a modern vice which has sprung up in our midst and apparently taken firm root. It behoves us, therefore, to study it carefully, whether as a vice or a disease, in all its bearings—its origin, its progress, its effects morally and physically, and the measures necessary to guard against it, to cope with it, and to arrest it.

The term morphinomania, as coined by Charcot, or morphinism, as used by Levinstein, signifies an uncontrollable craving for morphia by means of subcutaneous injection, which takes hold of the victim with a grip of terrible power, ever increasing its hold and dominion, and demoralising the mind, the senses, and the system of those who own its sway.

The first attempts at hypodermic medication were made by Mr. Rynd, of Dublin^a, in 1845, while to Mr. Wood in 1855 is due the popularisation of the method. Morphin is said to be less stimulating and exciting than opium, and its effects to be more lasting. One grain of the acetate of morphia is equal to about six grains of opium.

For a long time the almost identical vice of opium eating, including smoking and drinking, has been known and recognised as one of the great social evils of Oriental countries. In modern times, since travelling has become more universal and Chinese labour has been introduced into various parts, the coolies have brought their vice with them, and it has been

^a Vide Dublin Medical Press, March 12, 1845. P. 167.

taken up by a not inconsiderable number of the lower strata of society of these places, such, for instance, as San Francisco. But even in England opium has its victims, though not to such an extent as to obtrude themselves on society and be recognised as a great class of unfortunates. De Quincey maintains that in his time (1856) they were "a very numerous class indeed," and gives a long list of celebrities of the day known by him to indulge in the habit, stating also that in the humbler ranks of society "the number of amateur opium eaters was at this time immense," as he learned from the druggists; also he was informed by cotton manufacturers in Manchester that their work people were rapidly getting into the practice of opium eating. One of the characters in "Alton Locke" talks of buying "a pen'orth o' elevation," which is explained as meaning opium. It is said even now to be very much on the increase in several manufacturing districts.

Is morphia, then, going to take the place of opium and bring to us western peoples the horrors that we have been accustomed to associate only with the smoking dens of the East?

In the *Nineteenth Century* for September, 1887, Dr. Seymour Sharkey, in an able paper entitled "Morphinomania," sounded a note of alarm to the laity of these countries, and a warning that the use of morphia had already become a steadily-increasing habit, with very numerous victims in England, America, and France; that they walked in the best society, and took their "needle" in secret at the theatre or fashionable gathering. Already hospitals have been opened specially for the treatment of morphia habitués. There is one in Berlin,^a organised by Levinstein, and one at Gratz in Styria with 300 patients. In Brooklyn^b one has been opened for habitués of morphia, cocaïn, and chloral.

^a Vide *British Medical Journal*. 1890. Vol. II. P. 812.

^b Vide *British Medical Journal*. 1891. Vol. I. P. 1392.

Dr. Norman Kerr in his work on "Inebriety" says—"The result of my observation is that the habit of morphia injection is undoubtedly on the increase." According to Jouet and Zambaco the practice of morphin injection has become almost a matter of fashion amongst the ladies of Paris and Constantinople, and presents are made of pretty syringes with silver and jewel-set cases, so that ladies can make reciprocal injections of morphin at any convenient opportunity. To show how little is thought of the habit abroad, a traveller relates how a lady in a railway carriage in the south of France "raised her skirt so as to expose the bare skin of her thigh immediately above the stocking and injected a syringe full of morphia, giving her fellow-passengers, who listened with intense interest, a long account of the subjective symptoms that would follow."^a

According to M. Foville's estimate there were 40,000 morphinomaniacs in Paris in 1883. In 1893 there were, according to M. Dubut de Laforet, 100,000.^b

One of the popular preachers in Chicago lately stated to his audience that there were in that city 35,000 persons who habitually took morphia. He believes that lately the number is diminishing rather than increasing since cycling became popular, for it has led many to seek, from fresh air and exercise, the relief from insomnia and worry which otherwise would have been looked for through the hypodermic syringe.^c

The increase is not confined to our own and neighbouring countries. Western hurry has impressed on Orientals that opium smoking is a slow and clumsy method of attaining the end they desire, and so the hypodermic syringe is rivalling the pipe. Morphia injection was introduced into

^a British Medical Journal. 1892. Vol. I. P. 187.

^b British Medical Journal. 1893. Vol. I. P. 1026.

^c British Medical Journal. 1895. Vol. II. P. 1371.

Shanghai as a cure, forsooth, for opium smoking. From this it was introduced into Hong Kong, and six months after there were twenty houses carrying on a systematic trade, each house with an average of fifty clients, who called regularly morning and evening for their injection. These injections were given by ignorant, unqualified persons at a charge of about one halfpenny, and the practice was growing with such fearful rapidity that happily the authorities had to take notice of it, and issued an ordinance making the practice illegal.^a In 1895 we read that the consuls in China continually drew attention to the continued habit of injecting morphia by unqualified persons at several ports. Those who sell morphia and give the injections make a profit of from 200 to 400 per cent. One victim said, "It is much cheaper than opium smoking, and I get the same satisfaction out of it. I know of ten Chinese doctors, each of whom treats 50 to 100 men daily with this medicine."^b In 1896 it is reported that the practice of injecting morphia by unqualified persons having been checked at Hong Kong, has spread to Singapore, and is becoming very prevalent on the mainland.^c

It is quite evident, therefore, even allowing for some exaggeration in these statements, that morphinomania is increasing with terrible rapidity and spreading with fearful swiftness. There is equally little doubt that it is upon the members of our own profession that the greatest havoc is being wrought, as compared with any other class of the community. "Obersteiner, speaking of the prevalence of morphinism among the profession in Austria, hints broadly that, in his view, there is poetical justice in the fact that this fatal habit should work most havoc among the class of men who, by carelessly prescribing the drug, and instructing in the use of the hypodermic syringe, have been mainly

^a British Medical Journal. 1893. Vol. II. Pp. 803 and 1135.

^b British Medical Journal. 1895. Vol. II. P. 572.

^c British Medical Journal. 1896. Vol. I. P. 1531.

instrumental in disseminating it." ^a Of Levinstein's 110 cases, 47 occurred in persons belonging to the medical profession or dependent on it: thus, 32 physicians, 8 wives of physicians, 1 son of a physician, 4 nurses, 1 midwife, and 1 student of medicine were among his patients. M. Lacassagne states that of 545 morphinomaniacs within his knowledge, 289 were doctors, or over 50 per cent. He says it is well known that several of the most distinguished men of the profession in Germany who have died in recent years were devotees to the fatal drug.^b

Dr. Jules Rocard says that females and doctors are most addicted, and women delight in declaring how they indulge in the vice, and show with pride their ornamental syringes. Men take the greatest pains to hide their vice, so it is hard to estimate the precise numbers, but he believes that doctors and those associated with them form half the total male victims.^c Dr. Macnaughton Jones agrees that medical men form the largest number of cases.

The question then arises, how do these morphinomaniacs contract the habit? In very nearly all cases we fear that our profession must bear the blame. The first introduction to the seductions of the drug can generally be traced to its administration by a medical man for the relief of pain, melancholia, or insomnia. This is where our responsibility arises, and where we should consider well before we grant that first introduction. It is questionable whether for melancholia or insomnia it should ever be given, especially by the hypodermic method, except as a last resort.

Some cases undoubtedly originate in other ways, but they are quite in the minority. A patient of Dr. Richardson told him that he took it first simply to see what it was like, and, finding it pleasant, continued it till he found he could

^a Foot. Morphinism. Dublin Journal of Medical Science. Dec. 1889.

^b British Medical Journal. 1893. Vol. II. P. 142.

^c Cf. Union Médical. 1894.

not live without it. In another case, related by Obersteiner, a physician could not believe in the ease and pleasure it gave to a patient suffering from cancer; he took one dose himself as an experiment, but it immediately awakened in him such a craving that he was never afterwards able to give it up. William Blair, author of "The Opium Habit,"^a when reading De Quincey's "Confessions," shut the book after having read "the pleasures," and, without reading "the pains," he began deliberately to cultivate the habit, and soon learned the pains for himself with many a bitter regret! These may illustrate cases originating from *experiment* or curiosity, and doubtless many so arise. Some few may arise from *imitation*, as instanced by Dr. Foot, where "one could give no better reason for it than that a friend who lived in the house with him had recourse to it, and that he 'followed suit.'" At least one has arisen in a downright *criminal* manner—viz., where a husband induced his wife to take it, in order that he might get a divorce in the French Courts.^b

It is fortunate that every constitution does not bear morphia well, that on some it does not produce that intellectual excitement and psychical pleasure which creates the inappeasable hunger, that on others even small doses produce great depression, sickness of stomach, hallucinations, and horrible dreams. Also, that as with alcohol, the strength of each individual's self-control largely determines whether having once tasted the sweets he is able to firmly lay them aside again. But it is not a drug to be trifled with, for if any of us cast our thoughts back over a few of the cases we know of, we may remember some big mind not unworthy of our admiration that has been helplessly bound and irretrievably shattered by the unbreakable fetters of this vice; so while still vaunting in the strength of our own self-control we will

^a Harpur & Brothers. 1865.

^b British Medical Journal. 1891. Vol. I. P. 484.

yet wisely decline to put it to the test. Some few striking instances are on record, as if to cheer the fallen but not to encourage the foolhardy, where victims have conquered through their own unaided strength. Dr. Blair^a mentions the case of a man who used morphin for several years and gave it up after 65 days' struggle; it was ten months, however, before he began to get a little sleep. De Quincey continued the use, or abuse, of opium for 52 years. Four times he broke himself off it, but only for a few months at a time, and then continued it again. Finally he gave it up for ever. In his own words—"I triumphed, but infer not, reader, from this word 'triumphed' a condition of joy or exultation; think of me as one, even when four months had passed, still agitated, writhing, throbbing, palpitating, shattered."

Although it is hardly necessary here to draw a typical but imaginary picture of the usual mode in which the habit is induced, it may not be out of place to relate the actual facts in the case of a patient of my own. This gentleman, while on a visit to a relative in England who was a doctor, became suddenly ill and suffered severe pain; this was relieved by hypodermic injections of morphia. When leaving, this professional relative presented him with a hypodermic syringe and a tube of morphia tablets, telling him to use them if he again got the pain. Up to this time, even though quite recovered, he had his "shot" at bed-time. After a short time he gave it up gradually of his own free will, but with some little struggle. Not many months after, while attending him for quite another form of illness, his wife came for me one evening as he was in pain, but on arriving we found him looking well and happy. He explained that he had had "terrible pain," and knew that he would be given morphia for it, so had saved himself the time and me the trouble by

^a (Loc. cit.)

taking it himself. On expressing surprise at his having a syringe he related how he had got it; on my venturing to warn him of the dangers he courted he laughed me to scorn. Being a strong, able, intellectual young man, he had read De Quincey and knew all about it, scouted the idea of falling a victim and being unable to give it up at a moment's notice. Within three months, in spite of my constant effort and the constant efforts of all his friends, he was a confirmed morphinomaniac. Even after this short time, and though he was taking only from four to five grains of morphia a day, he had to leave his own home and go into a private hospital in order to effect a cure, which happily was accomplished, now two years ago. There the physical sufferings and the tottering of a fine intellect, as he grovelled on his knees to his nurse raving for morphia, were object lessons never to be forgotten.

The quantity of morphia or opium daily taken by a habitué varies greatly, partly according to the length of time they have been taking the drug, partly owing to individual susceptibility. Christison mentions that "450 drops of the best laudanum have been taken by a gentleman unused to opium without any other effect than some headache and constipation; and, what is even more singular, his son, aged six years, took 60 minims of muriate of morphia without any apparent ill effect." Another case is mentioned of a young man who, reading of the visions produced by opium, and "yearning for the *large* excitement," took 60 grains at a dose, yet lived to tell the tale.^a In certain diseases attended with pain enormous doses are tolerated. Dr. W. Smith^b mentions that in a case of chronic rheumatism 48 grains of morphia have been given, and in another case of metritis with rectal fistula, 24 grains of the acetate of morphia were

^a North American Review. Vol. XCV.

^b Commentary on the British Pharmacopœia.

given in one day. He also quotes Fleming as mentioning a case in which 20 grains of morphia were taken at a dose, and another case in which the daily quantum rose to the almost incredible amount of 462·9 grains of morphia. This, however, at last proved fatal. Dr. Braithwaite^a cites a case in which 40 grains were taken hypodermically in the 24 hours. De Quincey confesses to 8,000 minims of laudanum = 320 grains of opium, as his daily portion at one time of his life. In a case reported by Dr. Stuart, of New Zealand, the daily quantity injected for some months was 40 grains of the acetate of morphia.^b A case is reported of a chemist who took 60 grains by hypodermic injection per diem.^c Norman Kerr mentions the case of a female who drank one pint of laudanum daily, and swallowed 3 grains of solid opium at a single dose; also a case in which 20 grains of morphia were injected in a day in divided doses. In my own experience I have had one case in which 12 grains of morphia was the regular daily average, and another in which the regular dose was 15 grains supplemented frequently by solid opium. This case was an American sailor, who, from holding a high position, had sunk to the level of an ordinary seaman. He sailed from San Francisco for Liverpool having provided himself with 600 grains of morphia, 2½ lbs. of “gum opium,” and a pound of “ymshi,” to open when he used his morphia up. He calculated that by using only 15 grains a day his stock would last out till he got to Europe, leaving a little over in case of delay on the journey and until he got a fresh supply on this side. He explained that “ymshi” was the residue left in the pipe after smoking opium; this when rubbed up with water made a paste which he called “tinker;” by the addition of more water he was able to inject this hypodermically, but it was difficult to manage properly and caused

^a Medical Temperance Journal. Oct., 1887.

^b Foot (loc. cit.).

^c British Medical Journal. 1890. Vol. I. P. 1047.

abscesses. "Ymsli" could be obtained plentifully in San Francisco, where there are many smoking dens, and was very cheap. Having mentioned this Yankee, I may say here that he added several new words to my vocabulary—*e.g.*, he invariably spoke and wrote of the syringe as a "hypogun," and, of course, then the injection was a "shot."

These large doses are, of course, arrived at by degrees, tolerance being gradually cultivated. At the same time it is astonishing that the drug can be so quickly got rid of. It is well known that it is rapidly eliminated by the kidneys; it has also been well established by Hitzig^a that morphia is excreted by the stomach after hypodermic injection, and it is quite possible that some may, as Diedreich has pointed out, be converted into some substances which have the property of, to some extent, counteracting the toxic effects of the drug.

The next question to be considered is *diagnosis*. This applies only to cases in which the vice is concealed or unsuspected. In such cases it is, as Dr. Foot says, rather a question of *detection* than of diagnosis. Not unfrequently the cause of the patient's condition in the early stages is not for a moment suspected by his or her closest relations or friends. It is most studiously concealed from the doctor and guarded by the most vigorous falsehoods if the question is approached. A lady under Dr. Wilson's care exclaimed, "I call God to witness I neither now have, nor have had since I began the treatment, any preparation of opium or morphia whatever." Within ten minutes afterwards sixty quarter-grain pills of morphia were discovered secreted under her bolster.^b

The points to be noted are:—The face becomes pallid and pasty; anxiety, melancholy, and distrust are depicted on it; he wishes to be let alone, and so becomes unsociable and

^a Berlin. Klin. Woch. 1892. No. 49.

^b Cf. Foot (*loc. cit.*).

irritable; he is restless and shifty, and so loses the power of concentration and application to work; the appetite fails, and actual gastric disturbance is frequent; he sleeps little, and that little is disturbed by unpleasant dreams. The pulse reveals nothing unless a tracing is taken; it is said to be normal during the period of satisfaction, but when the patient begins to feel cravings for the drug the pulse curve shows a flat top. If such a train of symptoms arouses suspicion an examination of the urine^a may now give some light. If morphia be found in it an excuse may be made to examine the patient stripped, then puncture marks of the needle may be seen, especially if looked for on the extensor aspect of the left fore arm or on the outer side of the right thigh and buttock. An abscess or small ulcer may be revealed, or even many such, with scars of old ones and

^a Cf. Wynter Blyth. "Poisons; their Effect and Detection." 1884. P. 292, &c. :—

"The method adopted by Dragendorff to extract morphine from . . . urine is to shake the liquid (acidified with a mineral acid) several times with amyl alcohol, which, on removal, separates urea and any bile acids. The liquid thus purified is then alkalisied, and shaken up with amyl alcohol, and this amyl alcohol should contain any morphia that was present. On evaporation it may be clear enough to admit of identification, but if not it may be redissolved and purified on the usual principles." [That is, dissolve in acidulated absolute alcohol, filter, evaporate the filtrate to dryness, dissolve in water, make alkaline, and extract again with amyl alcohol.]

Tests (p. 280).—1. *Production of Morphine Hydrochloride*.—A solution of iodine dissolved in hydriodic acid gives, even in extremely dilute solutions, a precipitate. The crystals are dark red in colour, very definite in form, either free or collected in little radial groups.

2. *Iodic Acid Test*.—Dissolve in the least possible quantity of water, with the assistance of one or two drops of hydrochloric acid; mix with a very little starch paste, evaporate in porcelain dish, at a gentle heat, to dryness. After cooling, add to the dry residue a drop of a solution of 1 part of iodic acid in 15 parts of water; if $\frac{1}{20000}$ of a grain of morphine be present a blue colour will be developed.

No ptomaine has been obtained, which *both* liberates iodine from iodic acid, and gives with iodised hydriodic acid a precipitate of the definite and identical form of morphine hydrochloride. Therefore, both reactions above (but not necessarily one alone) are proof of the presence of morphia.

stains. Dr. E. H. Bennett has frequently said in my hearing that if one comes across a subcutaneous abscess on the limbs or trunk, and, seeing no immediate cause for it, find its contents foetid, suspect morphia injections; but failing all such definite proofs, if the suspected person can be isolated away from his own home, and closely watched so as to prevent him getting morphia, the craving will in due course appear if the suspicions are correct, and so unmask the case. Even then no reliance can be placed on the statements of the patient as to either the amount or the frequency of the dose. Where there has been concealment the physician must be very certain of his ground before making a diagnosis of morphinism, seeing that it may involve the patient with the charge of gross untruthfulness. In many cases the diagnosis is not difficult. One patient I have seen, a gentleman by birth and education, was in the habit of carrying a piece of dirty newspaper in his pocket, and after each injection tore off a small piece, moistened it on his tongue, and applied it over the puncture. His arms were in consequence one mass of festering sores, scabs, pus, and newspaper associated in sickening combination. Another patient, the Yankee before-mentioned, had hundreds of scars, blotches, and sores scattered over his body. These were to be found on all parts of the arms from the wrists up, all over both legs from the ankles up, all over the trunk, except a triangular area on the back, having the angles at the two shoulders and upper lumbar spine. In the groins the marks were particularly numerous, and he explained this by saying that he felt the effect more quickly there than anywhere else. The marks consisted of (1) bluish stains very similar in size and appearance to "*taches bleuâtres*;" in some parts these were as close together as the pits of smallpox, but I am at a loss to explain them, unless the pigmentation was due to "*ymshi*;" besides these there were (2) an enormous

number of pitted scars from small ulcers, together with (3) actual abscesses and ulcers in all stages, and (4) recent punctures also, appearing as small red dots.

The *effects* of the abuse of morphia are fairly well known in the abstract, but it may serve some useful purpose to consider them somewhat briefly in detail. At first, as a rule. the injections give genuine pleasure, but this soon becomes short-lived, and, after a regularly shortening interval, is succeeded by a restlessness and craving which can only be appeased by another dose. Very soon, therefore, it is in order to allay this craving—"the terrible feeling," "the horrible sensation," as some victims express it—that they seek a fresh injection, and not for the pleasure that it imparts. To avoid a too rapid shortening of the interval the strength of the dose has to be increased, and thus enormous doses are arrived at. The first effect of the dose is stimulating and exciting, brightening up the dormant faculties, and awakening any energy the frame is capable of, but this stage is soon succeeded by a feeling of calmness, and then by dulness and stupor, soon to be arrested by a renewal of the restless craving; these latter stages being very much longer than the one of excitation. The general condition is one of fatuous listlessness—in fact, in the later stages of the habit excitation may almost be said to be absent. Thus any of the business of life to be accomplished by the habitué must be attempted with the immediate aid of the needle—he is absolutely its slave. More and more the appetite becomes capricious, until it is altogether lost, so that it is with difficulty he can get the stomach to take food or to retain it. Once the habit is fairly established there is no diminution of the secretions, and the bowels, instead of being constipated, are regular or even relaxed. Sleep, however, is greatly interfered with, it becomes broken and fitful, and is disturbed by horrible dreams, so that he actually

dreads the approach of nightfall. All these conditions tend, less rapidly than might be expected, but none the less surely, to bring about impairment of the nutritive processes, nerve exhaustion, enfeebled mental capacity, general wasting and emaciation, terminating in insanity or death.

Besides these general ill effects, there is produced in men impotence and sterility, and in women amenorrhœa, sterility, and gradual atrophy of the genital organs.^a As with almost all other inebriates, "love is transformed into hate, and he not unseldom loathes the sight of the devoted companion whom, in his pre-narcotic days, he cherished with the tenderest devotion;" and with opium "so intense is the crave that a man has been known to mortgage his mother and sell his wife to gratify it. One man sold his wife for £12, and smoked the proceeds."^b Albuminuria is frequent, and uræmia not uncommon. Huchard reports ten cases of albuminuria in morphinomaniacs ending in uræmia, and Lauenstein reports six or seven similar cases.^c The wretchedness, misery, despair, and actual poverty induced by this absorbing vice not rarely leads the bond-servant to suicide, and this appears specially to be the case since cocaïn came into use.^d Many, indeed, seek to break their bondage by substituting another drug, such as cocaïn or chloral, only to find themselves doubly bound by, if possible, a stronger and more deplorable vice. A minor evil which these unfortunates suffer is the formation of abscesses and ulcers at the site of puncture; this is almost invariable sooner or later, as the familiarity which breeds carelessness leads to the use of dirty, uncleaned needles. This, indeed, in the case of the gentleman already mentioned who used newspaper to cover the punctures, was the immediate cause

^a British Medical Journal. 1893. Vol. I. Epit. 181.

^b Norman Kerr, "Inebriety."

^c British Medical Journal. 1890. Vol. I. P. 1275.

^d British Medical Journal. 1890. Vol. II. P. 812.

of death; though broken off his morphia, he developed vague symptoms, with an erratic febrile temperature, ending in pulmonary complications, jaundice, and death. A *post-mortem* examination revealed a large foetid abscess in the region of the tail of the pancreas; this had burrowed into the spleen, and opened into the colon. There were scores of small abscesses, varying in size from a pin's head to a large pea, scattered throughout the substance of the liver, and a similar condition in both lungs, together with large areas of consolidation. Another accident which frequently happens is the injection of the drug directly into a vein. The symptoms that follow this accident are striking, and so alarming that it may not be out of place to give them here. In about 30 seconds an intense tingling sensation is experienced in the palms of the hands and soles of the feet, soon accompanied by profuse sweating and intense throbbing, first over the forehead, then over the whole head, with excruciating pain as if the skull would burst asunder. The face becomes first deeply flushed, then cyanosed and swollen, the eyes fixed, staring, and bloodshot, the pupils generally dilated, as if over-stimulation had paralysed the ciliary nerve of the pupil sphincter. The action of the heart is then rapid, irregular, and feeble, and the breathing rapid and very shallow, as the least sigh seems to aggravate the intense cerebral pain. These symptoms last about 15 to 20 minutes, varying with the amount of the dose, then gradually pass off. Though the patient may have experienced these symptoms several times, and be quite aware of what has happened, they cause the greatest alarm to him and to anyone who may be witness of them.

It is said by some that the morphinomaniac becomes not merely a bodily and mental wreck, but also a striking moral wreck. I believe that this statement is much too sweeping. It is granted that many, if not all, when the drug is with-

held, will go almost any length to obtain it. Coleridge hired men to prevent him from getting opium, and dismissed them if they did their duty; he put himself under medical care to be cured of his vice, and pretended to be getting better, but all the time procured laudanum by stealth. There are plenty of instances of highly pious and honourable persons who, having become addicted to the drug, descended to lying, stealing, and cheating in order to obtain it, but if we look on that as part and parcel of their vice, we need not strip them of every shred of morality they ever had. It may not be said of all, but I believe it can be said of some—they were born gentlemen, they will die gentlemen, no matter to what depth of misfortune they have fallen.

The next and most important consideration is the *treatment*. Can these unfortunates be saved? They can, but the chances are against them. Foot says, “Emancipation from morphin slavery is unattainable by voluntary effort.” “Jaeckel is unaware of any successful case of self-treatment in morphinism, and does not advocate its being attempted, even in the case of medical men.” I have only found one case attested in which a chemist, who had taken up to 60 grains of morphia a day, gave it up in October, 1880, and in October, 1890, was still free, never having taken it in the meantime.^a It is obvious, therefore, we must assist them to do what they cannot do themselves. We must never forget the fiery ordeal, the terrible battle they have to fight before they can gain deliverance. The wretchedness and enfeeblement of mind and body will need unfailing sympathy, firmness, gentleness, and tact on the part of both physician and attendants to enable them to bear up and fight a *victorious* battle.

Of the methods, there are two which may pass without consideration—the *deceptive*, which is puerile; the *substitu-*

^a British Medical Journal, 1890. Vol. I. P. 1470.

tion, which is culpable. Cocaïn is the drug which has been most used as a substitute for morphia. Erlenmeyer, who has had a very large experience, comes to the following conclusions:—(1) That it does not stop the morphia craving; (2) that its effect is very transitory, lasting only from 12 to 25 minutes; (3) that cocaïn is a real substitute for morphia, and not an antidote; (4) that it should not be given, as its effect is so temporary and its use is dangerous, and very liable to develop a habit which is worse than morphinism. The other methods of *demorphinisation*, as Charcot calls it, consist in simply withholding the drug in one of three ways:—(1) The abrupt, or Levinstein's^a method; (2) the *rapid*, or Erlenmeyer's method; and (3) the *gradual* method.

Whether the habit has been of long or short duration the withdrawal of the drug is followed by a train of symptoms classically known as *Abstinenz-symptome*. In some cases they are much more severe, and appear with greater rapidity than in others. Some endure them quietly with silent fortitude, others with abject and apathetic despair, but with most there is constant restlessness, tramping excitedly up and down the room, wringing their hands, shouting, moaning, bewailing, entreating for the drug which alone can allay their sufferings. These sufferings are of various kinds—a peculiar uneasy sensation in the muscles; a “horrible sensation,” as one patient called it, and could give no further description, though he had no mean command of language; also agonising pain in the bones and the neighbourhood of the joints, “as if he had been beaten with sticks or the bones broken.” Again, intense pain of gnawing character in the stomach, “as if rats were gnawing at his stomach”—the very expression used by Mr. Addington and Dean Carlisle—as the patient pointed out to me afterwards when he read De

^a Of the Schömberg Insane Asylum, Berlin.

Quincey. There is great irritability of the stomach, so that little or no food can be retained. Frequently there is polyuria, causing intense thirst, and commonly there is profuse diarrhoea, which may, indeed, become so excessive and exhausting as to threaten life. I have been forced to stop the treatment, and give liberal doses of opium to check this dangerous symptom, but it was given in the form of pill, not by hypodermic injection. This stage of excitement is gradually replaced by a condition of profound exhaustion, through which the sufferings still continue; frequently hallucinations and delirium appear, with marked tremor, closely resembling the *delirium tremens* of alcoholism. Sleep is absolutely banished, and as food cannot be retained the patient is in a few days reduced to extreme prostration, which may end fatally even if he has survived so long. Indeed, Dr. Levinstein, who advocated the abrupt withdrawal method, says, "They most frequently become violent and suicidal, and out of a large number only 25 per cent. recovered."^a These symptoms are then so grave and alarming that the *abrupt* withdrawal method cannot be advocated except in rare instances, where the patient is strong and robust, where the habit has not become confirmed by long use, and the dose has not been excessive. Erlenmeyer, recognising the gravity of these *Abstinenz-symptome*, advocated the *rapid* withdrawal method, cutting off the whole supply of morphia by largely diminishing doses in from 6 to 12 days. This method, however, though preferable to the abrupt method in that the danger is diminished, leaves much to be desired; the *Abstinenz-symptome* appear, and though temporarily a little allayed at each injection, do not disappear, and the patient's sufferings are really prolonged. Erlenmeyer himself recognises this, and in 1896 wrote that "for three years he had abandoned the method

^a Scribner's Monthly. Vol. XX. P. 416.

associated with his name.”^a The *gradual* method is then the one which has found most favour with those in a position to form the best judgments. A case of Dr. Braithwaite’s will best illustrate this method. The patient was in the habit of taking 40 grains of morphia a day.^b The treatment began with 30 grains, and gradual reduction took place till the 42nd day, when none was given. The injections were given only three times daily; he got 30 grains of bromide of sodium at night, and \mathfrak{z} i. of Easton’s syrup three times in 24 hours.

One other plan of very gradual withdrawal may in some cases be useful. A solution is obtained of the drug, of the same strength as that used by the patient. Every syringe-ful withdrawn from the bottle is replaced by an equal quantity of distilled or boiled water. By this means the dose is diminished by infinitesimal degrees, till at last the patient is getting practically none of the drug at all.

From what has been said it is obvious that it will be almost an absolute necessity for treatment that the patient is removed from his own home and placed in a special home where he can be watched and nursed. It is very exceptional to find any case of successful home treatment of morphinism. It is better that he should not associate with any other patient suffering in the same way, as they will constantly talk of themselves, their doses, and pains, and will often plot to carry out some deception to obtain their drug. Besides this, the more the thoughts and conversation run on morphia the harder it is to recover the lost will-power that is so necessary for the struggle. Their surroundings should be

^a Prog. Medica. Aug. 1, 1896.

^b Treatment extending over 41 days—usual dose 40 grs. per diem:—

1st, 2nd day	30 grs.	9th–16th day	4 grs.	32nd–36th day	1 gr.
3rd	12½	17th–23rd	3	37th–41st	½
4th–6th	7½	24th–27th	2	42nd–56th	0
7th, 8th	6	28th–31st	1½		

One injection thrice daily; 30 gr. Na. Br. each night; \mathfrak{z} i. Easton’s Syrup thrice daily.

comfortable, bright, and cheerful. Their medical and nursing attendants should be attentive, kind, firm, and sympathetic. A good, tactful female nurse is much superior to a male nurse. In a case in which the habit was not of long duration, and the daily dose was only 4 to 5 grains, I adopted the abrupt plan. The patient was controlled, and tided over his period of misery, raving, violence, and despair by a young, physically weak, but firm, kindly, and sympathetic nurse. He was in a private hospital and not under restraint. It is almost certain that with a male nurse, or with any physically strong but less sympathetic attendant, he would have thrown aside all control, left the house, and taken again to his "needle," if he had not done worse by using violence to himself or others.

Besides these general considerations of the treatment, there are some particulars that should receive further attention. While diminishing the dose of morphia valuable help may be obtained from atropin; it arrests the profuse secretions, tending to prevent the occurrence of diarrhoea, and is said to materially allay the *Abstinenz-symptome*. It is recommended to begin with $\frac{1}{300}$ grain sulphate of atropin, and to gradually increase the dose, watching closely its effects.^a Dr. Gerard Smith recommends sulphate of spartein to lessen the abstinence storm, and when the pulse shows severe tension nitro-glycerine or nitrite of amyl gives rapid relief. Dr. Fleming recommends that when insomnia is very protracted, tr. of cannabis indica in ʒss. to ʒi. doses should be given at bed time. The bromides are of decided use in the treatment of the case, and may be given in large doses. Dr. Neil Macleod reported two cases in which a well-established habit was cured by bromide poisoning.^b

The best drug for insomnia is trional, given in 40 grain

^a British Medical Journal. 1894. Vol. I. Epit. 97.

^b British Medical Journal. 1897. Vol. II. P. 76.

doses to adult males, 50 grains to females. Sleep follows in from three to four hours, lasts on an average seven to eight hours, and is sound, dreamless, and refreshing. Dr. J. B. Mattison, of the Brooklyn Home for Drug Habitues, says ^a:—“We use it exclusively for the first six or eight nights, decreasing it gradually to half the initial dose. For the insomnia of morphia habitues it is the most valuable soporific we now possess.” He advises that when pain is present it should be combined with codein, and thus it gives satisfactory results.

Erlenmeyer has given a very important contribution to the treatment of demorphinisation.^b He has found by means of the stomach tube that where morphia has been taken there is a great excess of HCl. in the stomach. This is due, he believes, to the previous narcotic effect of the morphia on the glands, and the dulled sensibility of the nerves, as the morphia is excreted by the gastric glands. When, however, the narcotic source is suddenly cut off, the reverse of this condition obtains. There is hyper-secretion of the glands, and the nerves become hyper-sensitive, hence the extreme gastric and nervous symptoms. He, therefore, keeps the gastric contents neutralised with large draughts of 0·35 per cent. solution of bicarbonate of sodium, with the result that he has treated 30 cases in this way with the total absence of gastric and nervous symptoms, although the craving for the drug still remains.

Though it is rare to meet with pregnancy in a morphinomaniac, it does occur, and in such a case great care should be exercised, as any attempt to withdraw the drug is almost sure to be followed by abortion or miscarriage. It should also be remembered, as pointed out by Erlenmeyer, that infants born of mothers addicted to morphia are affected

^a Prog. Medical. August 1, 1896.

^b Medical Record. December 11, 1893.

with *Abstinenz-symptome*. They are, in fact, congenital morphin habitués, and as soon as they are separated at birth from their source of supply are liable to serious troubles, such as complete insomnia, which in one case lasted for 60 hours.^a This is quite borne out by the fact that morphia has been found in the blood of the umbilical vessels and foetal placenta of a new-born child whose mother was a morphinist.^b Again, should a morphinomaniac be seized by any acute or sub-acute illness his morphia must be continued, as if stopped symptoms may arise which may puzzle the physician and seriously endanger the patient's life. The case is related in the *Lancet* of a medical man, a morphia habitué, who got pneumonia. Most alarming symptoms of dyspnœa, cyanosis, weak and irregular heart action, and excessive rapidity of pulse, caused the greatest anxiety for the result, and it appeared that a fatal issue was prevented only by a recognition that these were *Abstinenz-symptome* of a morphinist rather than due to the pneumonia, and by a prompt recourse to the stimulant for which the system was craving.

The consideration here of the treatment for an overdose of morphia or opium may not be out of place. The most usual practice is the administration of an injection of atrophin, say $\frac{1}{60}$ grain, as an antidote, strychnin as a cardiac stimulant, black coffee and caffenin as a stimulant and to counteract the tendency to sleep, together with other plans to keep the patient from falling into deep narcosis and cardiac failure. Without wishing to discuss all or any of these as to their value or otherwise (and some may be open to discussion), there is another method of treatment which does not seem to be recognised and utilised as freely as it deserves. In 1894 Dr. Wm. Moor pointed out the value of permanganate of potassium as an antidote to morphia.^c In

^a Jouet. P. 41.

^b Bureau. Report Universal d'Obstet. et de Gynécologie. Aug. 25, 1895.

^c New York Medical Record. February 17, 1894.

1896 Dr. A. P. Luff, Lecturer on Forensic Medicine in St. Mary's Hospital, published a very full article on the subject.^a He mentioned 35 cases of Moor's successfully treated in this way, and 6 cases recorded in this country, of which 5 recovered. In the fatal case one pint of laudanum had been taken a considerable time before the remedy was given. The main facts of each of the 5 cases are also set out. He made 4 experiments with vomit, to which was added morphia, and then treated with permanganate of potassium. After each of the 4 experiments chemical examination failed to reveal a trace of morphin in the vomit. These experiments and the chemical tests were carried out with strict scientific care, and the various steps are given in detail. Dr. Moor experimented on himself, and, though very susceptible to opium or morphia, was astonished at the results he obtained, taking up to 6 or 8 grains of morphia by the mouth, followed by permanganate of potassium solution, without experiencing any ill effects. Surg.-Capt. Stanly Walker^b recorded a case in which 16 grains morphia sulphate had been taken, treated by permanganate of potassium, and resulting in recovery. Dr. Nathan Raw^c recorded 5 cases. Surg.-Capt. Maynard reported 19 cases treated in Calcutta.^d Some of these died owing to the time that elapsed before treatment. No ill effects were observed from the permanganate, even on *post-mortem* examination. There were no symptoms of irritation or subsequent inflammation of the stomach.

About 1 grain of permanganate in 1 pint of water is given for each grain or fraction of a grain of morphia. If the quantity taken is unknown, give 6 to 10 grains of permanganate. This must be continued for one to two hours, as morphia already absorbed is again excreted by the stomach.

^a British Medical Journal. 1896. Vol. I. P. 1193.

^b British Medical Journal. 1896. Vol. I. P. 82.

^c British Medical Journal. 1895. Vol. II. P. 76.

^d British Medical Journal. 1895. Vol. I. P. 1194.

The action of the potassium salt is a purely local one; it cannot be regarded as an antidote, nor will it save life where a lethal dose has been absorbed and taken into the circulation. It is of unquestionable use where opium or morphia has been taken by the mouth, and even where an overdose has been taken hypodermically it should be given also, as the morphia is undoubtedly rapidly excreted by the stomach and re-absorbed, but this would be prevented by its being destroyed by the permanganate. No good could be expected from hypodermic injection of the potassium salt as Dr. Moor^a has advocated, as it would be decomposed at once by the organic tissues and fluids of the body before it could get into the circulation to destroy the morphia. However, though we cannot expect so much from it in cases of poisoning by hypodermic injection as in cases where the drug has been taken by the mouth, it is well to bear it in mind.

For such an enslaving habit as morphinomania there should be even a more earnest consideration of prophylactic than of curative measures. Most of the blessings that Nature has placed within our reach may, by improper use, be turned into evils. Opium is one of these blessings. The immortal Sydenham is said to have stated that he would not practise his profession if he could not administer opium. We have seen its evils, and it is undoubtedly mostly through the agency of our profession that both its blessings and evils come about. We cannot give up the former because of the latter, so it is our bounden duty to do all in our power to guard against them. Unless in a case of fatal illness we should never give a hypodermic injection of morphia if we think it can be done without, or if sufficient relief can be obtained by any other form of medication. Never allow a patient to inject himself; never give a prescription for morphin if it is possible to avoid doing so; but if it is necessary, endeavour to

^a New York Medical Record. March 2; 1895.

prevent its repetition without your authority. Legislation might aid us in lessening the evil by more rigorous laws regarding the sale of the drug—*e.g.*, great good might be done if it were made illegal for pharmacists to repeat a prescription for morphia (cocain or chloral) unless it bore the signature and date of a medical man ordering it to be so repeated, and the renewal countersigned by the pharmacist.

With the exception of mentioning that in 1897 a French civil law court established a will made by a morphinomaniac,^a we will not go into the medico-legal aspects of the case.

In concluding, I would again say:—Let us guard against ever making a victim to this terrible vice, and if we meet with one, even though he be reduced to the lowest state of social degradation, let us hold out a helping hand with sympathy. In Dr. Norman Kerr's words, "Let the beginning of the helpless victim's intemperance have been in thoughtless abandonment to a dangerous pastime, in selfish indulgence in a vicious habit, or in criminal dalliance with an unlawful pleasure, as he crouches at my feet, and, with palpitating heart and quivering tongue, implores me to save him from himself, if I could turn coldly away, and bid him go die, and make a speedy ending on't, I could but look upon myself as—

"A stony adversary, an inhuman wretch,
Uncapable of pity, void and empty
From any dram of mercy.

"It may be in strict accordance with the stern decrees of justice, though I doubt it, to leave the unhappy victim to his fate. But is it right? Let us treat the despairing captives as we ourselves have been treated; let us deal with them as we have been dealt by; let us temper our justice with that compassion to which we owe so much; let us be just, but let us, too, be merciful.

^a British Medical Journal. 1897. Vol. II. P. 496.

“How would you be
If He, which is the top of Judgment, should
But judge you as you are? Oh, think of that,
And mercy then will breathe within your lips,
Like man new made.”

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DISEASES OF THE SUPRARENAL CAPSULES.

By JAMES B. COLEMAN, M.D., F.R.C.P.;

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Physician to the National Hospital for Consumption.

[Read in the Section of Medicine, April 14, 1899.]

IN 1855 Addison published his observations on the disease which is now known by his name. Some years before, as he explains, he “stumbled upon it” while investigating the causes of certain fatal cases of anæmia.

Addison’s description is as follows:—“The leading and characteristic features of the morbid state to which I would direct attention are anæmia, general languor and debility, remarkable feebleness of the heart’s action, irritability of the stomach, and a peculiar change in the colour of the skin occurring in connection with a diseased condition of the suprarenal capsules.” This description of the disease cannot be improved upon, except perhaps that the inclusion of anæmia amongst the prominent symptoms may be objected to. Addison supposed that the disease was due to loss of function of the suprarenal capsules, and this theory—suprarenal inadequacy—still holds the field.

Another theory, however, has to be reckoned with—the nervous theory—according to which the disease is supposed to be due to an affection of the abdominal sympathetic, or, as Dr. Goodheart puts it, “Strangling of the abdominal sympathetic.”

Dr. Rolleston^a thus sums up the rival theories—“Addison’s disease is due to an inadequate supply of suprarenal secretion. But whether the deficiency in this internal secretion leads to a toxic condition of the blood, or to a general

^aAllbutt’s System of Medicine. Vol. IV.

atony or apathy, is a question which must remain open. It should be added that Byrom Bramwell and Boinet have recently argued in favour of Addison's disease being due partly to direct irritation and neuritis of the sympathetic, and partly to suprarenal inadequacy. According to this view, the nervous and insufficiency theories are combined, and neither is exclusively right or wrong."

Addison believed that the train of symptoms which he described would ensue on any form of destructive lesion involving the adrenals, and in his paper he includes four cases in which these bodies were destroyed by cancer. Wilks, his pupil, points out that in those cases the true symptoms of Addison's disease were not present.

It is generally admitted that the common cause of Addison's disease is a tubercular fibro-caseous lesion of the adrenals, but it is true that the disease occurs occasionally when the adrenals are simply atrophied or invaded with malignant growths, and it must be conceded that Addison's disease has been caused by pressure or inflammation involving the semilunar ganglia *in the absence of any suprarenal lesion.*

This evening I bring under your notice two cases of disease of the suprarenal capsules. The first case was a typical one of Addison's disease, and the lesion in the adrenals was tubercular, as may be seen by the specimens and microscopic preparations which I exhibit. By way of contrast I shall relate a second case, specimens of which I also exhibit, the suprarenals being involved in a sarcomatous growth. In this case the characteristic symptoms of Addison's disease were absent, although it is probable that the symptoms from which the patient suffered were due to the diseased condition of the suprarenal bodies.

ADDISON'S DISEASE.

CASE I.—R. K., aged twenty-six, a laundress, was admitted to the Whitworth Hospital under my care on 26th April, 1898,

complaining of weakness and vomiting. She was in good health up to three years ago, when she began to get pale and weak, so that she was unable to walk or to work as well as usual, and she fainted occasionally. She has suffered from vomiting off and on for two years. More than six months ago she noticed her face and neck becoming brown, and still later she began to lose flesh. She was working as a housemaid up to 18 months ago, and on account of "shortness of breath" on going up stairs she changed her occupation to that of a laundress. About that time she was treated in another hospital for anæmia, and she thinks her skin was slightly discoloured then.

Her family history is unimportant, being free from tuberculosis.

On admission to hospital.—She is of slight build, and fairly well nourished. She walks with some difficulty on account of weakness. Her skin is curiously pigmented; her face and neck are of a dirty brown colour, the colour being most intense around the root of the neck. There is not much discolouration over her chest, but the areolæ of her nipples are deeply pigmented. The back of the neck and shoulders are dark. Over the rest of the body the pigmentation is most marked in the following regions:—Hypogastric and iliac regions, inner side of thighs, popliteal spaces, front of knees below patella (a circling band of pigment), bend of elbows, front borders of axillæ, and front of forearms. The buccal mucous membrane shows some bluish-black spots and patches of pigment.

Her appetite is bad, and she vomits nearly every day. Bowels are usually constipated. Heart and lungs normal; pulse feeble but regular—80 per minute. Menstruation has never been interfered with. Urine is normal in every respect. On examining her blood, red cells are diminished in number to 3,325,000 per cubic mm., whilst hæmoglobin is 100 per cent., and white cells 8,300 per cubic mm.

The patient became progressively weaker, so that she was quite unable to stand. Tabloids of suprarenal extract were administered for a month, without producing any improvement in her condition. For ten days before her death vomiting became more urgent and she refused to take food; her pulse was very rapid (120 to 140) and feeble, she developed a febrile temperature, and she gradually passed into a state of extreme debility, languor, and torpor. She died on the 7th July, ten weeks after

admission to hospital, and about three years after the onset of the symptoms.

Necropsy.—Body looks plump, quite out of keeping with emaciated appearance of her face; there is more than the normal amount of subcutaneous fat; muscles are red and healthy; heart is very small and weighs only five ounces; lungs are healthy except for some adhesive pleurisy on right side; liver weighs 49 ounces, and through its substance are seen numerous greyish-yellow nodules; similar nodules (resembling tubercles) are present in the mucous membrane of the duodenum close to the pylorus; the stomach is anæmic; pancreas and kidneys are anæmic, but otherwise normal; the *suprarenal capsules* are the seat of fibro-caseous degeneration on both sides, the left one being the larger of the two, and about three times the normal size; lumbar and thoracic glands normal; spleen slightly enlarged and of a deep red colour; uterus and ovaries healthy.

Microscopic examination of the suprarenal glands proved the lesions to be tubercular; the nodules in the duodenal mucous membrane were due to overgrowths of lymphoid tissue around the gland tubules (Addison noted a similar condition in the stomach, giving rise to the appearance of "mammillation"). The small size of the heart in this case was also in keeping with Addison's experience. In reference to the state of the blood, which showed a considerable loss of red cells without any diminution of hæmoglobin, Tschirkoff reports two cases in which the red cells were reduced to 60 per cent, with the hæmoglobin over 100 per cent. The high percentage of hæmoglobin was found on spectroscopic examination to be due to a great increase of reduced hæmoglobin in the corpuscles; methæmoglobin was also noted.

SARCOMA OF ADRENALS.

CASE II.—P. C., aged twenty-three, a cooper by trade, was admitted to the Whitworth Hospital on 27th December, 1898, suffering from epileptiform fits. He states that about three months ago he began to lose his strength, and that he got the first fit early in October. At first the interval between the fits was about a fortnight, but by degrees the intervals became shorter, until last week, when he had four attacks. The fits resemble true epilepsy in every respect. He was in good health previous to the onset of the fits. He was addicted to alcohol, but he never had syphilis.

On admission to hospital, the patient is rather dull, his speech

Necropsy.—Body well nourished. Brain contained excessive quantity of subarachnoid fluid, but was otherwise normal. *Heart*, slight old pericarditis, muscle soft and flabby; a small round tumour, the size of a cherry, grew from the wall of the right auricle into its cavity. *Lungs* showed hypostatic congestion; *Kidneys* were both somewhat congested; spleen was enlarged and soft; both adrenals were enormously enlarged, forming tumours the size of a closed fist; their structure was lobulated so as to resemble the pancreas to the naked eye, but the organs retained their natural shape, although so excessively hypertrophied; their combined weight was 12 ounces.

Microscopical examination showed the growths in the heart and adrenals to be round-celled sarcoma. The spinal cord showed degeneration in the motor tracts, and to a lesser degree in the posterior columns.

A possible explanation of this case is that there was primary sarcoma of the adrenals which existed for some time without symptoms of Addison's disease; but the disease of the adrenals interfered with their function and set up a toxæmic condition of the blood, which in turn was the cause of the "fits," and of the degeneration of the cord.

We know that various degenerations of the nervous system have been found in Addison's disease; and in pernicious anæmia we have the analogy of toxæmia producing spinal cord degeneration.

Rolleston^a points out that in some cases of Addison's disease, judging by the lesion seen at the autopsy, the disease must have been latent for months or years; then suddenly, perhaps from some depressing conditions, the symptoms burst out in full force, and the patient dies in a few days or weeks.

DR. FINNY pointed out that great destruction of the suprarenals could take place without any of the symptoms of Addison's disease supervening. There was also a group of cases which presented all

^a Loc. cit.

the evidence of suprarenal melasma, while a necropsy showed that the suprarenals were perfectly healthy. He himself had an example of the latter group under his care. The patient was suffering from tubercular disease, but the suprarenals were unaffected. He therefore thought it probable that the disease was due to some affection of the large nerve elements in the neighbourhood rather than to structural changes in the gland itself.

DR. J. W. MOORE said that, as had been shown, there were three groups of cases—namely, disease of the suprarenals and pigmentation, disease without pigmentation, and pigmentation without disease.

DR. COLEMAN, in reply, said he thought Byrom Bramwell's theory the safest, in which he combined the suprarenal inadequacy and the nervous theory.

ON CHRONIC FOLLICULAR PHARYNGITIS.

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[Read in the Section of Medicine, April 14, 1899.]

CHRONIC pharyngitis, or as it is sometimes called clergyman's sore throat, is one of the commonest affections of the upper respiratory tract. It is not, as its alternative name would imply, confined to public speakers, nor does it in my experience occur with much greater frequency among people with whom public speaking is an essential part of their profession.

Though the best marked examples are to be found among adults, and in men rather than women, yet it is met with frequently among the young of both sexes. That the disease has long been known and repeatedly described is not surprising, since a large portion of the region involved can be well inspected without any other aid than that of a common spatula.

Patients generally complain of the throat being sore and tired, and the voice a little husky, especially after prolonged speaking or singing, and occasionally of slight difficulty in swallowing, this difficulty being more pronounced when the bolus is small, as when the saliva is swallowed, than when large, as at meal times. Arising from a feeling of mucus being constantly present there is a persistent desire to hawk and clear the throat, hardly less annoying to their neighbours than to the sufferers themselves. They find the state of the weather largely influences their comfort, a moist, cold day being less tolerable than a warm, dry one.

On inspection the pillars of the fauces, soft palate, and posterior pharynx wall, and in severe cases the larynx, are seen to be redder than normal. The superficial vessels are dilated, and the mucous membrane slightly roughened. These appearances are better seen at the upper part of the throat, especially on the faucial pillars, than lower down. The lymphoid follicles on the posterior pharynx wall are enlarged and prominent, and it is this item among the physical signs that lends to the disorder its distinctive name. In some cases a thick, red cord of swollen tissue runs from above downwards on both lateral pharynx walls immediately behind the tonsil, disappearing from view behind the palate above, and hidden by the tongue below, quickly tailing off in the mucous membrane. The cause of these well-known conditions has been variously attributed to repeated attacks of acute inflammation, overstraining of the voice, excessive smoking, unhealthy occupation, especially those where employés are crowded in an impure and dusty atmosphere, &c.

The treatments adopted have been, in addition to getting rid as far as possible of the apparent cause, thermic or chemical cauterisation of the hypertrophied lymph follicles on the posterior pharynx wall, and of the masses on the lateral wall; avulsion of the follicles by sharp forceps; brushing the pharynx twice a week for several months with astringents, such as 6 per cent. silver nitrate, or zinc chloride, glycerine of tannin, borax, and a host of other antiseptics and astringents; and finally an infinity of gargles, varying from plain water to elaborate concoctions containing a great variety of drugs, in the hope that if one did not do good another might.

In my earlier days as a laryngologist I conscientiously tried all the more rational of these methods, and though I often succeeded in temporarily curing the patient, I know of no case treated by me on these lines which remained free from the symptoms for more than a few months; nor

was it until a considerable number of these cases had passed through my hands that I saw I was only treating an effect and not a primary cause.

In my opinion and experience chronic follicular pharyngitis is in the vast majority of cases the result of nasal obstruction, or, more immediately, mouth breathing.

It will be convenient at this place to say a word or two about the functions of that neglected though highly important member, the nose.

By the majority of people, and among them are some whose duty it is to know better, the nose is looked upon merely as the organ of smell, and as an aid to the sense of taste. The nose is not an organ but a member, and smell is the meanest of its duties. Its really important work consists in preparing and modifying the air, so that it may be fitted for entry into the delicate respiratory passages below, and this it does in three ways—

First, by warming the air. Anyone who has dissected a nose can hardly fail to have been impressed with the extent and richness of its blood supply, a richness out of all proportion to the need of the part, and which finds expression in the ease with which its lining membrane is made to bleed. It is indeed a beautiful hot water system, where the heat of the circulating fluid is transferred to the air with which it is in contact, the rate of transference being increased from what it would be were the nose a single plain tube, by the extra surface exposed, not only on both sides of the septum, but also on the turbinated bones, especially the inferior and middle. So perfectly is the air warmed, that elaborate and careful experiments have shown that by the time the air reaches the naso-pharynx its temperature is practically that of the blood.

Second, by moistening the air. The watery mucus with which the walls of a normal nose are constantly smeared readily gives up its moisture to the passing air, the great

blood supply to the soft parts aiding in two ways—promoting by its heat the surface evaporation, and by its constituents feeding the secreting parts with the necessary watery elements. Experiment has here, too, shown that the air when it reaches the naso-pharynx is all but saturated with moisture.

Third, by filtering the air. If impure dusty air be blown through a tube the sides of which are smeared with glycerine or any similar substance, it will be found, especially if the tube is not quite straight, that it comes out pure at the other end, the dust being caught and held by the slimy surface. This is precisely what happens in the nose. The moist surfaces act as a most efficient trap for solid particles suspended in the inspired air; thus they are first caught, and afterwards expelled in the periodical blowings to which all normal noses are subjected.

We have only to look at the motes in the sunbeam in order to be convinced of the great importance of this factor in the struggle for health, especially to us who live in cities and crowded places, where purity is the rarest attribute of the atmosphere; and especially also when, as our bacteriology teaches us, these motes are so many rafts for bacteria, pathogenic and saprophytic.

There are reasons too for suspecting that the nose exercises a destructive effect on bacteria. This has not yet been put beyond dispute, but, waiving this claim, there is more than evidence enough to show, that on *a priori* grounds the efficient discharge of the functions of the nose must be of prime importance to the welfare of the respiratory tract.

If from any cause the nose is obstructed, breathing must be carried on through the mouth. Now inasmuch as the alteration of the inspired air from contact with moist, warm surfaces is a purely physical process, and that the air will go on absorbing both heat and moisture until its

saturation points are reached, and that these cannot be attained in the mouth, it follows that the throat is compelled to take on the functions of the nose, and part with heat and moisture sufficient to satisfy the demands of the air, at the same time freeing it from dust. It follows, too, that the first, or highest, portion of the throat is where we must expect the severest effect of the abnormal condition to evidence itself, for this is the part struck by the stream of air when at its driest, coldest, and dustiest.

In these cases of pharyngitis from nasal obstruction, when the cause is, as just shown, primarily a mechanical one, it is to be expected that if any portion of the mucous membrane were unexposed to the irritation of the air, that part would remain normal. And this I have found to be the case. If the back of the pharynx be illuminated, and the soft palate raised with a probe, it will be seen that the pharyngeal wall above the level of the palate is unaffected: while immediately below that point, where it is unprotected by the palate, the other condition obtains, the line of demarcation being quite sharp and coinciding with the lower level of the palate.

I regard this fact as of great importance in the proof of the condition being the result of nasal obstruction.

In obedience to this demand for heat and moisture from the pharynx, the superficial vessels dilate, and by a continuance of the irritation for a sufficient time, a chronic low form of inflammation is set up, mucus is poured out, and as it yields its moisture it thickens and becomes more tenacious, and *pari passu* the mechanical irritation of its presence and the difficulty of its removal increase.

The comparative narrowness of the nose enables a forced expiration to send the air through its cavity at a velocity sufficient to expel mucus, however tenacious, with comparative ease; but the pharynx being more open allows of no increase in the velocity of the air, and to overcome the

difficulty and dislodge the glutinous material, the pharynx is voluntarily narrowed during forced expiration, and hawking results.

The difficulty in swallowing is contributed to in two ways. The presence of tough mucus provokes acts of swallowing. Now the exertion required varies within limits in inverse ratio to the size of the substance to be swallowed, and therefore the smallness of the bolus demands that the effort must be vigorous in order that the wave of contraction may not fail to lay hold of and push the matter before it. If the mucus were more watery a single effort might entirely remove it for the time, but when it is remembered that its natural toughness is increased by evaporation, and that it is adherent to the walls by which it is secreted, it is not hard to understand how futile must be the attempts to remove it, though from its tickling those attempts must necessarily be made. The muscles of swallowing therefore become overworked and painful, and a condition analogous in many ways to writer's cramp established.

Again, the inflammation of the pharynx wall, above referred to, is not always confined to the mucous membrane, but extends into the muscles, and this no doubt contributes to the discomfort attending deglutition in many of these cases.

That the larynx even when affected is not always complained of is intelligible, since the brunt of the evil is borne by the pharynx, and the further down we go the more nearly is the air to the ideal condition, and therefore the less it irritates the surfaces with which it comes in contact. When the larynx is involved, as it always is in severe cases, the conditions which obtain are almost identical with those described in the pharynx. The vocal cords are injected, thickened, and nodular, and impurity of the voice, if not actual hoarseness, results.

The evil effects of smoking in this as in most other affections of the throat have, I am convinced, been greatly over estimated.

I do not believe that the pipe or the cigar are ever in themselves injurious. When consumed in the ordinary way the smoke never passes the cavity of the mouth, for during the act of sucking the soft palate and the dorsum of the tongue must necessarily be in contact, and so the throat is completely cut away from the influence of the fumes. The case of the cigarette is different, for cigarette smokers, not content with the amount of absorption of the active principles of the drug that goes on in the mouth, inhale the smoke to the very great detriment of the air passages. In the same way pipe and cigar smoking, if done by a number of persons in a small room, may, by creating a fog, prove harmful both to the non-smoker and the smoker, but with proper ventilation, and *a fortiori* in the open air, the practice can have no hurtful effect on the throat of either.

Among the causes to which chronic pharyngitis is attributed comes that limbo of disorders, gout. I have more than once had congestion of the throat pointed out to me as the sole evidence of this disease. That gout may possibly cause such a primary condition in the throat I am not prepared to deny, but I have seen no case in which this physical sign, even when looked on as an evidence of gout, was not associated with some form of nasal obstruction, or which was not relieved by nasal treatment.

In some cases of chronic pharyngitis, as in all other abnormal conditions of the throat, the nose should be thoroughly examined.

This advice is usually given with the tacit implication that it can be followed by anyone. For my own part, I must say that I found it many times more difficult than

either retinoscopy or laryngoscopy. Examination through the nostril, simple as it looks, demands for its efficient performance the power of concentrating the attention on one retinal image only, and the most perfect control over accommodation in the observing eye, in order to see anything at all, and when seen the character, size, and position of the object, and its relation to neighbouring structures, have to be determined.

I do not intend here to treat obstructive diseases of the nose at all exhaustively, but inasmuch as the radical cure of chronic pharyngitis involves, in general, putting the nose in working condition, a few words on the subject will not be out of place.

The causes of nasal obstruction are sometimes anatomical, more often pathological. Among the anatomical causes, spurs, or deflections of the septum, are in adults very frequently met with.

In these cases the obstructed side is small, and the tissues thin and atrophic, while the opposite side is large, and the tissues hypertrophic, the result partly of overwork and partly of repeated acute inflammation to which such cases are liable. These are as a class best treated by removal of the offending portion with a knife, or if the cartilage be calcified, a fine saw.

Post-nasal growths are of course among children the most frequent causes of obstruction, and it will always be found that whether the child complains of the symptoms of chronic pharyngitis or not, the physical signs will be present in old-standing cases.

This in itself would be sufficient to justify the removal of adenoids, even if their presence were not baneful for so many other reasons; but in this immediate connection it is well to point out that in an unrelieved case, though it is usual for the growths to atrophy and leave the passage clear,

in early adult life stenosis still remains. The cause of this is easily seen. If for any reason a member of the body is not used for many years, it will, if the owner be an adult, atrophy, or if a child, remain undeveloped. Examples of this are common enough. It will be sufficient to remind you of the diminutive proportions of a leg in a neglected case of hip disease, where the thigh has been allowed to ankylose in a position such as to prevent the foot touching the ground. The leg and foot are quite healthy, lacking nothing except exercise in order that they should be developed as on the opposite side; but physiological idleness has effected an anachronism, and we have a child's leg on a man's body. In a precisely identical way the persistence of nasal obstruction from adenoids enforces in an unrelieved case a similar physiological idleness with the parallel result of a child's nose on an adult's head. Partly, therefore, from the fact that the nose in such cases is not equal to the demand put upon it when at length the post-nasal space is clear, and partly, no doubt, from the difficulty of shaking off a bad habit acquired in infancy, and practised night and day during adolescence, mouth breathing persists with its attendant evils.

A trained eye can recognise such people in the street. Examination of such a person shows, in addition to the characteristic *facies*, flattening from side to side of the nose and the nasal fossæ, prominence of the front teeth, an abnormally high and narrow arch to the bony palate, diminished distance between the molars of the right and left sides, chronic pharyngitis, and other signs which we need not stop to mention.

Chronic follicular pharyngitis in people with an abnormally small nose is a very difficult condition to cure, because we are more or less limited by the outer bony wall of the nose from enlarging the air space to the require-

ments of the individual. But still much can be done by sacrificing a small quantity of the tissue on the outer wall, especially the soft parts covering the inferior turbinated bone.

Chronic hypertrophic rhinitis is readily recognised by the swollen and turgid condition of the inferior turbinated bodies. With it is commonly associated post-nasal thickening and its resultant, post-nasal catarrh. These are best treated with the electro-cautery, by laying down a linear scar along the enlarged bodies, which when it contracts will brace up the tissues out of the way, and so free the air space. In severe cases reduction of the hypertrophied bodies with the electric snare may be called for. One wall only of the nasal fessa should be cauterised at a time, otherwise two opposite points may adhere, and synechia result, leaving matters worse than before. With ordinary care this should not occur, but I have known the accident happen.

As a fairly common cause of chronic pharyngitis, polypi of the nose deserve mention. The distress of the primary disease is, however, so great that the throat is rarely complained of. Their removal should be accomplished with the snare and not with the forceps. The snare properly used removes them more completely; it leaves the normal tissues untouched, it does no violence to the bones of the nose, and therefore the patient suffers but a fraction of the pain, and none of the damage caused by the forceps. Furthermore, it is not as well known as it deserves to be that when the polypi have been well snared the judicious use of the electro-cautery on the ground from which they grew will often effect a radical cure. To those of us who having seen polypi removed by the forceps, in the old way, have ourselves adopted the snare, it is astonishing that the more improved method should not have beaten its once

respected predecessor out of the field, but unfortunately the forceps in many places is still the only instrument used.

In a number of cases of chronic pharyngitis, however, examination of the nose shows no obstruction; the patient is able to breathe quite naturally, and yet what I venture to call the characteristic symptoms of nasal obstruction are present.

Inquiry will elicit that these patients snore, or waken in the morning with a dry tongue. Some of them will deny it, but if you send them away and ask them to take observations on themselves they will tell you at their next visit that your suspicion was well founded, and that they find their nose so stopped at night that they cannot breathe through it without a sense of suffocation, but after getting out of bed a few minutes suffice to make it quite clear again.

This story has been told me so often that the condition must be a very common one. We have here evidently an engorgement of the erectile tissue of the nose; whether, as is most likely, it is due to mechanical congestion, the result of the head being lower in the horizontal position than in the upright, or whether it is a vasomotor phenomenon predisposed to by some local condition, and determined by sleep, I cannot say; but at any rate we have the condition and fortunately the cure too. The electro-cautery along the inferior turbinated bodies will, when the scars heal and contract—*i.e.*, in from six to eight weeks—most probably cure the patient. If in a couple of months he still complains, it shows too little has been done. I think I may without offence call this condition nocturnal obstruction.

Though the vast majority of cases of throat irritation result from nasal obstruction, yet there are still to be found a few in whom this condition, still the result of not using the nose, is unassociated with obstruction. There are teachers or others who talk a great part of the day, often under very

unhygienic conditions, such as overcrowded and dusty school-rooms. The special liability of teachers to this form of sore throat is due to the fact that people when speaking inspire through the mouth, even when the nose is quite free, and when this is done persistently the throat sooner or later suffers, for the effect is of the same kind, if not to the same degree, as when the nose is stopped. The remedy is simple, provided the nose is healthy. The patient should be directed to speak deliberately, and instead of gulping in the air, to inspire through the nose between the sentences, a habit not difficult of acquisition.

In conclusion, let me say, that the gravity of diseases of the nose in general is very much underrated. We have in chronic pharyngitis a perfectly definite and tangible effect of abnormal nasal conditions on the respiratory passages. The necessity for rhinoscopy in throat disease was only pointed out a few years ago, and it will not be surprising if some of the chest troubles now believed to be idiopathic should, when our knowledge is riper, prove to be preventible by the endowment of a functional nose.

We have the very best grounds for believing that phthisis is often caused by the inhalation of pulverised tubercular sputum, and for my part I am convinced that the victims of consumption would be much fewer if normal noses were more common.

THREE CASES OF DIABETES INSIPIDUS.

By J. LUMSDEN, M.D. (UNIV. DUBL.);

Physician to Mercer's Hospital.

[Read in the Section of Medicine, May 19, 1899.]

HAVING had the singular good fortune to have had during the past year under my care at Mercer's Hospital three cases of what I regard as genuine examples of diabetes insipidus (that form spoken of as hydruria by Ralfe), and as the affection is undoubtedly a rare one, which is proved by the fact that only eight cases appeared in the London Hospital Records from 1876 to 1895, and Ralfe, who wrote the article in Clifford Allbutt's "System of Medicine," only collected sixty-nine authentic cases, and Roberts seventy-seven, I therefore thought the notes of my two cases would be of some interest to this Section, although I have little fresh to add in throwing light on the ætiology or pathology of the affection. My third case I owe to the courtesy of Dr. Burgess, who kindly allowed me to take her into hospital, the full notes of which case you may remember were read in an interesting paper by Dr. Burgess two years ago at a meeting of this Section.

CASE I.—M. M., aged nine years, admitted June, 1898; family history unimportant. His father, a healthy labourer, died from influenza after a few days' illness. Mother, a charwoman, is apparently healthy; several healthy brothers and sisters living. I could discover no history of any constitutional delicacy in any branch of the family after careful inquiry. The boy is fairly well nourished, blonde, of a fresh, healthy complexion, bright, clear eyes, and fairly moist skin. He has a right inguinal hernia, which was unsuccessfully operated on five years ago, and he at present wears a truss. Tongue and lips very dry, and he complains of an insatiable thirst; appetite very poor; vomits occasionally after solid food; urinates frequently, and shivers very often before micturition. Physical examination reveals no abnormality; heart's

action somewhat irregular and excitable; pulse intermittent at times, of low tension, its rate varying from 75-110. Complains frequently of headache, which is sometimes very severe, causing him to cry, and lasting for nearly a day at a time; is not referred to any particular part of the head. He is of an excitable and emotional temperament; flushes up when spoken to. Increased patellar reflexes; quadriceps reflexes slightly present, and an attempt at ankle clonus; sensation normal; temperature normal, sometimes subnormal.

About six or eight months ago it was first noticed he was drinking large quantities of water; it apparently came on gradually, and did not follow an illness or accident, although a history of a fall on left side of head three or four years ago is to be obtained. His thirst became greater, and if clean water could not be found he would drink milk, buttermilk, and even the soapy water from his mother's washing tubs. As far as I can gather, the polydipsia first appeared. On admission he drank from 560 to 660 ounces of fluid in twenty-four hours; the greatest quantity consumed in one day being 860 ozs. = 43 pints. Subsequently when his allowance was restricted in amount he would run to the bathroom when the nurses' backs were turned and drink from bath tap, and on two occasions he was seen to drink his own urine. He invariably drank more than he passed; the amount passed, however, was hard to measure accurately, as he frequently wet his bed. He voided from 500 to 600 ozs. in 24 hours, the greatest quantity measured for one day being 750 ozs. (37 pints). The urine was of a pale greenish or bluish colour, slightly alkaline, or very faintly acid in reaction; sp. gr. 1001-1002. No albumen or sugar was ever discovered, although daily examined for a period extending over five months. Inosit was not present. No increase of phosphates, and nothing abnormal found microscopically. The urea varied in amount from 150 to 600 grains in 24 hours, and calculating from Ralfe's table of physiological urea excretion estimated from weight and age, which takes into account the active nitrogenous metabolism of youth, the amount voided at first was distinctly excessive, especially as at that time his appetite for albuminous and solid food was very poor, his diet being entirely milk. Eyes examined by Mr. Story revealed no abnormality; blood normal. His tonsils, which were chronically enlarged, were removed by Mr. Maunsell, and post nasopharynx cleared of some adenoids which existed.

In this case result of treatment was altogether disappointing, although when finally discharged last February his general health was wonderfully improved, weight increased, appetite good, and all subjective symptoms disappeared; yet the polyuria and polydipsia were still excessive—drinking from 300 to 400 ounces, and passing about 300 ounces daily.

During his stay in hospital I tried him with the following treatments:—Infusion valerian, valerianate of zinc ($\frac{1}{4}$ grain thrice daily increased gradually to 12 grains in 24 hours), bromides, arsenic, ergot with iron, cod-liver oil and tonics, antipyrin, opium, codeia, belladonna, guaiacol, galvanism, phosphoric and nitric acids, and blisters to nape of neck and epigastrium. Some of the drugs in this very formidable list appeared to give some temporary relief, but nothing more, and his improvement, such as it was, I attributed to the effects of hospital life, and the altered hygienic surroundings and good food.

CASE II.—P. R., aged sixty-four years, labourer, admitted March, 1899. Family history good. Father and mother lived to be over eighty. Three healthy brothers living. Has been a very heavy drinker (of stimulants), chiefly beer, all his life. He says for the past twenty years he has complained of excessive thirst and frequent micturition; it came on without any apparent cause; latterly has become more excessive. Ten years ago he states he was in the habit of drinking upwards of twenty pints of beer daily. He gives a history of a violent blow on the head which rendered him unconscious for some hours twenty years ago, and it was immediately after this he first noticed the polydipsia. Since then he has had several falls on his head, but none apparently of a serious nature.

In appearance he is a healthy, vigorous-looking man, 12 st. 4 lbs. in weight, of ruddy complexion, healthy aspect.

He has lost nearly a stone during past few months. Skin very dry; complains of dryness of mouth; no excessive flow of saliva; tongue covered with a dark brownish fur; bowels regular; sleeps

well, and appetite good, but not excessive. Physical examination reveals no abnormality except a musical systolic murmur occasionally to be heard at the heart's apex. No cardio-vascular evidence pointing to granular kidney. Heart's impulse feeble. Pulse 72, regular, and of distinctly low tension, and no evidence of hypertrophied walls. Pupils equal. Reflexes sluggish. Complains of frequent occipital headache, and pains in lumbar region, the former very acute at times. Quite contented while allowed to stay quiet and in bed, but complains of being easily tired and feeling nervous when up; occasionally complains of nausea, though never vomits. Thirst is excessive, drinking from 260 to 360 ounces in twenty-four hours, and passing about twelve pints of a pale-coloured urine; density 1003; very faintly acid or neutral; no albumen; no sugar; inosite is present. No casts or other morbid product to be discovered microscopically. Urea from 240 to 516 grains in twenty-four hours.

Dr. Story reports commencing cataract left eye. Signs of chronic glaucoma; visible pulsation of vessels without any signs of neuritis or retinitis.

His age, alcoholic history, occipital headache, and polyuria naturally makes one suspicious of granular kidney, but careful and repeated examinations fail to detect the presence of albumen or tube casts; this with the low tension pulse, the absence of all ocular and cardio-vascular symptoms, the degree of polyuria which is in excess of that generally associated with contracted kidney, appear to me to justify the diagnosis of diabetes insipidus. Since his admission he has been tried with valerianate of zinc, infus. valerian (double strength), phenazonum and nitric acid; the former diminished the polyuria and polydipsia by half, but did not reduce to normal.

Dr. Burgess has very kindly given me permission to mention the following case, the notes of which have already been read by him before this Section:—

CASE III.—A girl aged seventeen. History of a severe fall on the back of the head four years ago, shortly after which polyuria and polydipsia appeared. She used to drink upwards of twenty pints daily. When admitted under my care she was passing and drinking about fourteen pints daily. No symptoms of granular kidney whatever. Pulse distinctly low-tensioned. Urine light

greenish colour; sp. gr. 1002, neutral; no albumen; no glucose; no inosite. Urea greatly decreased in quantity.

I tried her first on several drugs without any improvement resulting. I finally ordered valerianate of zinc, commencing $\frac{1}{4}$ gr. thrice daily, and increasing gradually till she was getting 22 grs. in twenty-four hours. After a week of this treatment the amount of urine voided began to diminish gradually, and at the end of a month it had reached the normal for the first time since the affection declared itself. She remained in hospital subsequently for over a month, the treatment being continued for a week or two and gradually withdrawn. She has been under my constant observation ever since, and has been taking syrup of the iodide of iron and cod-liver oil. Her general health has much improved. She has put on weight, and has been drinking and passing a normal quantity of fluid. How long this normal state will last, or whether she will relapse, I cannot say; but I think it is very interesting to note the marked improvement while on the drug given in increasing doses.

The same drug in my other cases, although apparently causing some improvement at first, finally had to be stopped, either because it disagreed or failed to reduce the passage of urine to the normal limit.

Diabetes insipidus is apparently a very rare affection—its ætiology varied, little known of its pathology, its treatment unsatisfactory, and its course uncertain; sometimes influenced by treatment, and even cured; at other times persisting for a number of years, without any visible deterioration of health beyond a feeling of weakness and general malaise; and sometimes running an acute course, terminating fatally in a few months; and sometimes the affection disappears of its own accord untreated.

Its origin is evidently nervous, and is supposed to result from a want of inhibitory control of the vaso-motor renal nerves. Injury to the nervous system, such as a fall or knock on the head, a violent emotion, such as fright or a sunstroke, is its not infrequent antecedent. Tumours of

the brain, and lesions chiefly about the neighbourhood of the fourth ventricle, have been met with in several cases, and it will be remembered in one of Bernard's famous experiments on animals puncture of a certain spot in the floor of the fourth ventricle near that region, injury of which causes glycosuria, produced polyuria.

The most reasonable view, as expressed by Osler, is—that it results from a vaso-motor disturbance of the renal vessels, due either to—

1. Local irritation, as in the case of abdominal tumours;
or to
2. Central disturbance, in the case of brain lesions;
or to
3. Functional irritation of the centre in the medulla,
giving rise to a continual renal congestion.

Clinically it may be divided into five forms—

1. That in which the aqueous superflux is most marked—called hydruria (by Willis).
2. Cases attended with a copious discharge of urine with a deficiency of urea—anazoturia.
3. Cases accompanied by a superabundance of urea—azoturia.
4. A form described by Tessier as phosphaturia, or phosphatic diabetes, which he distinguished from azoturia. This form is associated with certain dyspeptic conditions, and is characterised by a considerable increase in the excretion of phosphoric acid in the urine, while the urea is not increased in amount.
5. And lastly, a form described by Dr. Fuller, and called by him baruria, which is characterised by a general increase throughout of the solid urinary constituents, whilst the aqueous secretion remains tolerably constant.

DR. J. W. MOORE remarked that two of the three patients were males, which was the usual proportion. Sixty-four was an unusual age for diabetes insipidus, as it was more commonly met with at a much earlier period of life. He remembered a case of a boy aged eleven, who but slightly improved under treatment for about six months. On inquiry some years afterwards he was said to be quite well, and had seemingly undergone a spontaneous cure. The infectious fevers seemed to have a remarkable influence on diabetes insipidus, and a cure had been known to occur after one of these fevers, which they knew often affected the vaso-motor functions considerably.

DR. WALTER SMITH enquired as to the reaction of the urine. In one case, at least, it was alkaline, and this raised the question of what the normal acid reaction of the urine was due to, as all secretions came from the blood or lymph, which were undoubtedly alkaline. A parallel might be drawn between the secretion of urine and that of sweat, which latter was influenced in its reaction by the epidermic structures through which it passed, since on carefully testing these epidermic structures they were found to be always acid in their reaction. He believed that something similar took place in the secretion of urine, and that the normal secretion in the glomeruli of the kidney was alkaline, and that in passing through the convoluted tubes it became acid, though whether this was due to the secretion of acid or the absorption of alkaline salts he did not know. He would like to know the evidence as to the presence of inosit in the urine of one of the cases, for it was well known now that inosit had nothing to do with the sugar group, but that it belonged to one of the benzene or aromatic derivatives. Great stress had been laid on the relation of nerve injury, especially head injuries, to this disease. In his opinion, however, the only relation of nerves to the secretion of urine was of a vaso-motor sort.

DR. LITTLE, referring to the occurrence of the disease in old patients, related the case of a patient in the Adelaide Hospital who used to pass an enormous quantity of pale urine of low specific gravity, and was suffering from intense thirst. The patient, who was middle-aged, was shown to the class as a typical example of diabetes insipidus. He finally fell into a comatose condition and died. On making a necropsy they found the coats of the bladder much thickened, and the prostate enormously enlarged. The ureters were as thick as a child's small intestine, and the kidneys

were completely excavated, resembling what is known as surgical kidney, but without any ammonio-magnesium phosphate or pus. The peculiarities of the case were that there was no cystitis or evidence of inflammatory changes in the bladder, the ureters, or pelvis of the kidney.

DR. J. LUMSDEN, replying, said the urine in two of the cases was as a rule alkaline, and in the remaining case it was either neutral or slightly acid.

CLINICAL INVESTIGATIONS ON WIDAL'S REACTION AS A DIAGNOSTIC IN TYPHOID FEVER.

By H. E. LITTLEDALE, M.B. ;

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[Read in the Section of Medicine, May 19, 1899.]

DURING last year, while Resident Medical Officer in Sir P. Dun's Hospital, I had the opportunity of making clinical investigations on what is generally known as Widal's test for enteric fever, and examined the blood of 120 cases of different kinds. I must, however, specially mention that it was the clinical diagnostic value of the test and nothing else that I wished to try.

The methods I adopted throughout were briefly these—A tube of bouillon was inoculated with typhoid bacilli from a stock agar culture, and kept at 37° C. for from 8 to 20 hours, and examined just before use to see that the bacilli were active and free from clumps. Blood was drawn from the patient's ear lobe by making a stab with a needle and squeezing out the blood into sterile glass tubes, which I made over a Bunsen burner, and the ends of the tubes were then sealed in the Bunsen flame. When the serum separated out it was expelled from the tubes on to a large sterilised microscope slide by breaking off one end of the tube and heating the other in the flame. The slide was sterilised simply by heating it in the flame, and then letting it cool. On the other end of the slide a certain number of the typhoid bouillon drops was measured out with the platinum loop, the loop then heated out and let cool, and a drop of the blood serum taken up on it, and mixed with the bouillon. A hanging drop was then made from this mixture and examined

with a Leitz No. 7 objective immediately, and at varying intervals up to two hours, and sometimes longer. At first I used to take the blood on filter paper, let it dry, and get the serum by rubbing up the dry, bloodstained part with sterile bouillon, but I gave this up, as it was impossible to estimate what proportion of serum one had in the solution. The results I obtained I classified into positive, negative, and doubtful: positive results being those in which the most of the bacilli were matted together into clumps appearing in a typical case about one-third the size of a threepenny piece with a Leitz 7 objective 3 eye-piece and 170 mm. tube length. Besides this clumping action, the motion of the bacilli was usually very considerably slowed, but this is not always so, as I came across some undoubted typhoid cases of a severe clinical character, in which the unclumped bacilli remained exceedingly active for hours; and again, there were a few cases not typhoid which caused extreme slowing of motion in the bacilli, but no clumps. I also considered a result positive when the clumps were very much smaller than those above-mentioned, but very few bacilli left unclumped.

A doubtful reaction I considered was one in which a few small, loose groups of bacilli formed, usually with slowing of motion, but no, or at all events very few, typical clumps. By groups I mean masses of bacilli lying rather side by side, and not in the tangled mass that a clump is, and from which bacilli occasionally disengaged themselves, and wandered away.

A negative reaction was one in which there was no trace of clumping. The maximum time limit I adopted was two hours, and if no clumping had taken place then I considered the reaction negative, but I occasionally did not get time to examine the hanging drops after two hours, and sometimes had to do it after as late as three hours or later.

This is my own standard, which may, of course, be a fallacious one. The proportion in which the blood serum and bouillon ought to be mixed to give a standard reliable result is a very doubtful question. At first I used what I called a 1 to 9 dilution—that is, one drop of blood serum mixed with 9 drops of bouillon—but Durham and others have shown this to be fallacious, and my own experience is that it is useless clinically except where it gives a negative result. I then adopted a 1 to 39 dilution, but I think this is also open to error, though to a much less degree, as I only had two cases which were not typhoid which gave a doubtful reaction with this dilution.

Throughout the entire series of investigations I used the same stock culture of typhoid bacilli growing on agar.

I shall now describe the results obtained from a clinical point of view, and to do this I have necessarily had to arrange them under several different headings.

The first series is one of 42 cases, which were clinically undoubted typhoid, and usually obviously diagnosticated on admission. Every one of these cases gave an absolutely positive Widal reaction. Some, however, were only tested with the $\frac{1}{9}$ dilution, but most of them with the $\frac{1}{39}$ dilution. All of these cases were in the second week of the disease or later, with the exception of five, two of which were on the fifth day, one on the sixth, and two on the seventh day of illness. These were the only cases in which I was certain of the early date of the disease, and all of them were tested with the $\frac{1}{39}$ dilution, but I am unable to say if the reaction can be obtained earlier than the fifth day.

The second series is one of nine cases which were clinically doubtful, either for a time or throughout the entire stay in hospital, while the Widal reaction was absolutely positive in every case. I shall give a very short account of each of them.

The first case was a man who was admitted with the symptoms rather of rheumatic fever than of typhoid, with severe pains and swelling in his shoulder joint, but the onset of his illness and its subsequent course was very like typhoid. He had, however, no diarrhoea, and had only two spots resembling typhoid rash. His spleen was considerably enlarged. He gave an absolutely positive Widal result in the third and fourth weeks, but he was taking salicylate of sodium when the test was applied, and I do not know whether that may not cause clumping.

The second was a case which turned out an obvious typhoid case, but had no signs of typhoid fever, except high temperature for several days after a positive test result was obtained.

The third case, similar to the last, proved to conclusion *post-mortem*.

The fourth case was also similar to the second.

The fifth case, sent in late one evening as scarlatina, with very sore throat and slight redness about the neck, gave an absolutely positive result that night, and turned out to be an obvious typhoid case, and not scarlatina.

The sixth case, sent in during what was stated to be the third week of illness, gave an absolutely positive result on day of admission. He never developed any typhoid signs, except rather severe bronchitis and delirium, and his temperature dropped by crisis eleven days after admission, and remained normal till he went out.

The seventh was a case I know nothing of clinically, but was, I believe, a very doubtful one: the reaction, however, in the second week was quite positive.

The eighth case was admitted with a history of several weeks' illness, with absolutely no sign of typhoid, except a slight rise of temperature, which reached normal a few days later, so this case was evidently at the end of his illness on admission, also absolutely positive Widal.

The last case was one which never had any signs of typhoid but headache and an irregular temperature for three weeks after admission, but gave absolutely positive results on several occasions.

All of the cases which remained doubtful throughout were examined with the $\frac{1}{39}$ dilution, but, except in the case of the last, I do not know if they ever had typhoid before. The last-mentioned case never had any illness before that he could recollect.

The next series is one of eight cases in which the clinical diagnosis was doubtful; the Widal reaction was also doubtful. Most of these cases were examined only with the $\frac{1}{9}$ dilution, and several of them can hardly be considered doubtful, but I think it best to put all cases in a separate group when there was any sign, however small, of clumping.

The first case was a boy with symptoms very like typhoid, but without any diarrhoea, spots, or enlarged spleen. He, however, developed physical signs of pneumonia, three days after admission, in right upper lobe, and temperature started to fall by a very slow crisis next day. He never had any symptoms or physical signs of pneumonia prior to this. Widal on fourth day, $\frac{1}{39}$ dilution; 20 hours active culture gave, as result, no effect after one hour; after two hours, motion quite active; a few small clumps. Same on sixth day. On sixteenth day $\frac{1}{9}$ dilution, nine hours very active culture, a few clumps, and motion slowed after two hours. No change after two and a half hours with $\frac{1}{39}$ dilution.

The second case was a man aged fifty-three, which no one would ever have diagnosed as typhoid from his symptoms and signs. He came to the dispensary some days before admission with headache, and history of being ill for several days, with marked constipation. His tempera-

ture was 100° F., but he refused to come in that day. Three days later, however, he was admitted, with a temperature of 100.4° F., thickly-coated tongue, bowels moving only very slightly, but no other symptoms or signs, except a feeling of incapacity to work. His temperature fell to normal the day after admission, and remained so for two or three days, then rose again to 101° F. for two days, and after wavering about 100° F. for a week longer, it ultimately became quite normal. Constipation seemed to be the cause of his illness, as when his bowels were got into regular order he got quite well. He never had any illness before, except "fever and ague," 30 years previously, in Mauritius. On sixth day of illness, with a ten-hour very active culture, $\frac{1}{39}$ dilution, there was an immediate formation of a few small clumps, and the motion was slowed, but it was just the same three hours later—a condition I never saw in undoubted typhoid, as the clumps always increased in size and number. A $\frac{1}{9}$ dilution gave immediate formation of small clumps, which became very much bigger after two hours.

Examined again on the 10th day with a 20 hours very active culture, $\frac{1}{39}$ dilution, the motion was unaffected, and only a few small clumps formed, and one or two large groups after three hours.

The next case was one which gave doubtful reactions on several occasions with $\frac{1}{9}$ dilutions, but absolutely negative with $\frac{1}{39}$ dilution. This case had a very typhoid-like onset, and when I saw her on admission she looked a very probable typhoid case, but beyond headache, constipation, coated, dry tongue, and high though irregular temperature, she never developed any other signs of typhoid, and after running a course of about four weeks with this irregular temperature she became convalescent, and was soon quite well.

I have since heard that she now has a slight cough and

pain in her side—that is, eight months after the above attack. So it may possibly be an obscure tubercular case.

As all the other doubtful reactions were only examined with the $\frac{1}{9}$ dilution I shall not detail them, as such results are of no value, as the previous case well shows.

The fourth series consists of 20 cases which were clinically doubtful, in which the Widal reaction was absolutely negative even in $\frac{1}{9}$ dilution. Some of these cases were treated as typhoid for safety sake in spite of the Widal reaction, and quite rightly I admit, but this shows their close resemblance to typhoid, although no single one of them was a typical typhoid case.

I shall just cite one of these cases as it shows the value of the Widal test. This was a case of a child with acute tuberculosis which came in with a history exactly like typhoid, and a temperature of 104.0° F. The case was diagnosticated acute tuberculosis chiefly from the extreme cyanosis, out of proportion to any of its physical signs. There was, however, profuse diarrhœa, large spleen, distended abdomen, but no spots.

After two weeks the child died, and general tuberculosis was found *post mortem*, and no sign of typhoid lesions. The Widal reaction was absolutely negative, even with 1 in 10 dilution. I think we have here an instance of the value of the test when we can separate with certainty acute tuberculosis from typhoid.

The fifth series was 28 cases, medical and surgical—in fact any case which had no suspicion of typhoid—and in every one of them with a $\frac{1}{9}$ dilution the result was negative.

The sixth series is one of five typhus cases, all of which gave an absolutely negative result. One of them, however, is worth citing, as it shows the uselessness of the $\frac{1}{9}$ dilution. This was a man who had been two weeks ill, who had every possible sign of typhus. I only saw him once with Dr.

Falkiner, so cannot relate the subsequent course of his case. Examined in the second week, this man gave an absolutely negative reaction with a $\frac{1}{39}$ dilution, and an equally absolutely positive one with the $\frac{1}{9}$ dilution, the same culture and serum being used in both cases, and the tests applied just after each other.

The seventh series consists of three cases supposed to have had typhoid two years, six years, and four months ago, all of which gave an absolutely negative result.

The last group is a curious one, and consists of three diphtheria cases.

The first was a case being treated with antitoxin, the last dose of which had been given ten days previously. This case gave an absolutely negative result with $\frac{1}{9}$ and $\frac{1}{39}$ dilutions.

The second case had received its last dose of antitoxin three days previously. Examined with a 40 hours culture, which, however, was very active and free from clumps, and $\frac{1}{39}$ dilution gave an immediate slowing, almost cessation, of motion, and few small clumps. My only subsequent note, however, is "very large clumps ten hours later." With $\frac{1}{9}$ dilution motion was stopped and very large clumps were formed, which were visible to the naked eye an hour later.

The next case had received 3,000 units of antitoxin eleven days previously! typhoid culture, very active; ten hours old; $\frac{1}{39}$ dilution gave immediately great slowing of motion and large clumps, one hour later the unclumped bacilli appeared rather more active; $\frac{1}{9}$ dilution gave immediate cessation of motion, and enormous clumps quite filling up the field.

I next examined two bottles of antitoxin serum as to their agglutinative capability, having first proved the serum quite sterile. With the first bottle I merely mixed one drop of serum and one of bouillon together, and the result I find I have notified is "cessation of motion and clumps after two

hours." The second bottle I tested with a $\frac{1}{5}$ dilution—*i.e.*, one serum, nine bouillon—and the immediate result was slowing of motion, no clumps; two hours later, however, there were numerous large and small clumps.

This agglutinative action is, I believe, common to the blood serum of horses in general, and not merely those that are immunised to diphtheria.

I have now concluded the list of cases which I examined, and I shall merely say a few words as to what I consider from my small experience the test is worth clinically, and also mention a few practical points in connection with its application.

The most valuable and reliable results which the test gives is its negative value, and, as far as my experience allows me to judge, I think if a case gives a negative result absolutely in the second week one may be certain that it is not typhoid.

As to the doubtful results, I believe they can be eliminated by using higher degrees of dilution and as young a culture as one can get. A six hours old culture is the earliest I have ever used, and, if all conditions are favourable, an actively growing culture should be obtainable in this time. There will, however, I am afraid, always be cases which are on the border line between positive and negative, and nothing but long experience and absolute ignorance on the part of the investigator as to the clinical course of the case will enable him to make up his mind, as it is impossible to give an impartial opinion when one is absolutely certain that a case is or is not typhoid clinically. It is for this reason that I have cited more or less in detail the results clinically and to Widal of the doubtful cases.

In conclusion, I shall just say a few words more about the methods of applying the test. Objections will be raised to my method of mixing the typhoid bouillon and serum owing

to the difficulty of getting a drop of constant size in the platinum loop, but this may be avoided and a uniform drop obtained by getting the loop quite full, and just let the drop touch the slide, and by this means a uniform drop is always obtained. Other methods in use consist in drawing up definite quantities of blood serum and typhoid bouillon into graduated capillary tubes, and mixing them as in Thoma's haemocytometer; or a better method is first to dilute the serum, say twenty times, with sterile bouillon, and then mix a drop of it with an equal quantity of typhoid bouillon to get a $\frac{1}{40}$ dilution.

Personally I do not think these methods are sufficiently superior to the one I use to counterbalance the extra amount of trouble they entail.

A point one must be careful about in applying the test as I do is to be certain that the glass slide on which the serum and bouillon are to be mixed is quite cool, which takes several minutes after it has been heated for sterilisation in the flame.

The best method, I think, to get the serum from the tube—especially when one gets it in a vaccination-tube, and has only a limited amount at one's disposal—is to break off one end of the tube, hold the other end in a forceps, and hold a platinum loop edgeways to the broken end; then warm the other end gently in a spirit lamp flame, not a Bunsen burner, as it is too hot, and sends the serum out with a spurt. In this manner all the serum necessary will be caught in the loop.

DR. M'EVOR said that good service had been done in emphasising the fact that Widal's reaction was essentially a quantitative reaction. A German investigator in a recent paper in Berlin claims to have got a reaction before Widal's reaction could be obtained. This he accomplished by making cultures with gelatine from the faeces, and,

on submitting them to a temperature of 72° for three hours, he states that there is an appearance in the colonies perfectly distinct from the *Bacterium coli commune*.

DR. FINNY said there was often great difficulty in diagnosing typhoid fever from tubercular disease. One case in particular he remembered in which the patient had all the symptoms of tubercular meningitis, but the application of Widal's reaction gave a positive result and a necropsy confirmed the diagnosis, as the ulcers could be seen in an advanced stage of healing.

DR. J. W. MOORE observed that the positive reaction in the three cases of diphtheria and the experiments made with the anti-diphtheritic serum were remarkable. The test was of the greatest clinical importance.

DR. LITTLEDALE, in reply, said he had no experience of the test that Dr. M'Evoy had spoken of. He was informed, however, that Gärtner's bacillus, which in all probability belonged to the race of the colon bacillus, clumped long before the typhoid bacillus. It was always very difficult to isolate the typhoid colonies in the fæces.

CASES OF TACHYCARDIA.

BY J. MAGEE FINNY, M.D.;

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[Read in the Section of Medicine, May 19, 1899.]

THE subject of my paper is one of comparative rarity, and the cases which form its basis are good illustrations of it in its varied aspects as regards causation, duration, and gravity. It is remarkable, writes Dr. Bristowe in 1887, that cases of extreme rapidity of the heart's beat should have been so long overlooked, and yet the first three recorded instances seem to have been made in the *British Medical Journal* in 1866, by Dr. Cotton, Dr. Jas. Edmunds, and Sir Thos. Watson ; and to their graphic description of the condition in its typical aspects little could be added by Dr. Bristowe, who himself, in 1887, published ten cases in a paper which forms one of the most valuable contributions to the subject.¹ The fact that the condition of paroxysmal heart-hurry so often occurs in otherwise healthy individuals, may possibly account for its being so rarely observed, and further, its occurrence may take place without the smallest consciousness on the patient's part that his heart's rate is in any way perverted or accelerated, unless, and until, a medical man, on trying to count the pulse, may call his attention to its rate.

The name of "Tachycardia" is of modern days, and seems to have been given—15 years after Dr. Cotton's case—by Proebsting, a pupil of Gerhardt, in 1881. Whittaker, whose description is perhaps the best of those I consulted—prefers the word polycardia or pykno-cardia (πυκνός σφυγμός of Hippocrates), heart-hurry.

He says—"It was in old times included under palpitation. The distinction is now drawn between the two, in that palpitation is a beating of the heart that is felt by the patient, while tachycardia is an increase in the frequency of the beats. Tachycardia, like palpitation, is always only a symptom, and never a distinct disease. In palpitation there is usually, but not necessarily, an increase of frequency; but the heart may throb violently, yet may beat slowly. Tachycardia is usually, but is not necessarily, perceived by the patient."²

In fact, one of the great distinguishing peculiarities of *pathological* as contrasted with *symptomatic* tachycardia, is the little disturbance it gives to the sufferer. It may be so slight that the patient goes about his duties as "unconscious as a babe of anything unusual" (Balfour),³ or there may be some slight sense of oppression, some nervous excitement or dyspnoea, or a little lividity.

Thus, it is more a state of altered rate of the heart's action, not a disease of the heart, and as it occurs in paroxysms, Bouveret gave it the name of "Paroxysmal Tachycardia." It is as though the heart's action was gone wrong, and the organ, no longer under control, beat of its own free will. Some fancifully speak of it as of a watch running down, when the check on the mainspring is broken, or as an engine, on an incline, no longer under control of the brake.

Physiology teaches that the heart is under the control of two nervous influences—the stimulating filaments from the sympathetic cervical ganglia to the cardiac ganglia, and the repressing or inhibitory nerve derived from the pneumogastric. Experiment has shown that when the inhibitory nervous influence is withdrawn or destroyed the heart's beat is accelerated up to 140 or 160—but not faster (Martius)⁴—and pathologically a lesion in the

medulla, destroying the origin of the vagus, has similar results, for Doelger reported, in 1883, a case of apoplexy of the inhibitory centre of the medulla, in which the pulse rose to 168.⁵ And again, the motor ganglia in the heart itself may be over stimulated. But neither pathological nor physiological research has as yet explained how the heart can suddenly rise from 70–80 up to 240, 260, or 308—and after a period, shorter or longer, revert with equal suddenness to its original rate. It is worth noting that during the paroxysm of tachycardia there is no increase of arterial pressure, or of work done by the heart. The rapid action is primarily due to shortening of the diastole, and therefore during systole so little blood is expelled that the aggregate amount is not increased in the minute. Physiology further shows that the accelerator nerves in the heart have no trophic relations to the heart, and therefore the rapidity of the pulse, due to acceleration or irritation, should produce little effect on the heart or general system. In fact, essentially, paroxysmal tachycardia is a neurosis of the heart, a “cardiac nerve storm” (Wood).⁶

Talamon suggests that it is of the nature of an epileptic seizure, and may be found in persons of neuropathic history.⁷ Gibson considers all these views purely speculative, and adds another—that its essential nature is analogous to the respiratory changes observed in the Cheyne-Stokes respiration.⁸

In truth, paroxysmal tachycardia is induced by no known cause, although it has been attributed to, and seemingly produced by, excess of tobacco, a fall, a blow, or reflexly by indigestion, worms, nasal polypi, urinary calculi, &c.

Larcena classifies the causes of tachycardia under eight headings, as given in Whittaker's exhaustive article, already referred to:—(1) In diseases of the heart and blood-vessels; (2) febrile; (3) peripheric compression of

one or both vagi or their nucleus; (4) organic diseases of the nervous system; (5) general diseases—*e.g.*, typhoid, diphtheria, &c.; (6) toxic—*e.g.*, alcohol, &c.; (7) reflex, from any organ; (8) neurosis.

Tachycardia may occur at any period of life—from 70 years of age (Balfour)⁹ to 6 years. This latter I will mention, as it is the youngest case on record, and the most recent, as far as I can discover (described by Herringham). It was a child of 11, who for 5 years previously had had sudden attacks of heart-hurry without cause, and lasting 36 hours to 13 days, subsiding during sleep. The pulse-rate ranged during the attack from 240-260. There was very little precordial discomfort; no pain; respirations were accelerated, with slight cyanosis, but no anasarca or pulmonary oedema. There was no evidence of cardiac disease, except enlargement of the organ in the transverse direction both in the intervals and still more during the attack. The child had been, previous to the first attack, in robust health, and the history pointed to an absence of rheumatism or syphilis. Different forms of treatment, based on various theories as to the cause of the tachycardia, were tried, but had no effect in checking or alleviating the attacks.¹⁰

In one of Bristowe's cases the paroxysms of recurrent tachycardia were of some years' duration—the attacks lasting 3 days, in another they lasted 5 weeks. In the intervals some patients enjoyed perfect health, others were invalids—and one (case 4, p. 111), was actively employed as a governess, with much responsibility, aged forty, who travelled about inspecting schools, while her heart was beating 200-260 (average 216). After five weeks the heart suddenly fell to 70-80, and for fifteen years these paroxysms would recur with very little general distress or discomfort. In the end this lady died with symptoms of cardiac obstruction. There was no autopsy.¹¹

The following two cases in my own practice illustrate the occurrence of paroxysmal tachycardia in the foregoing aspects. Case I. was a lady with pre-existent and well-marked valvular and arterial disease. Case II. a lady in whom there existed no previous disease.

CASE I.—*Paroxysmal Tachycardia*—Mrs. M., aged sixty-eight, of Westport, of active habits, though of a spare build, and not unhealthy, while on a visit to town was suddenly seized on March 20th, 1887, on her return from a drive in her carriage, with shortness of breath. She complained of a slight sense of tightness or oppression across the chest, but was not aware of any palpitation nor did she feel ill, and she was able to walk up three flights of stairs to her bedroom. Her daughter noticed some pallor and sent for me. I found her as described. Her pulse was 180, small and running. The tension was low, while the first sound was shortened and accompanied by a systolic murmur, the second sound being more marked and ringing, and by it the heart's pulsations were counted by the stethoscope. Rest in bed, and digitalis and brom. potassium with carminatives, were soon followed by relief, and in three hours, when I again visited her, her pulse had fallen to 120, and she was generally better. The next day the heart and pulse were normal, 78. The state of the valvular lesion could now be readily made out, and I satisfied myself she had mitral regurgitation and dilatation of the aorta with rigid valves, probably all due to atheroma. There was no evidence of dilatation. A return of the tachycardia occurred again a few days later without any cause, while she was indoors, but it was of shorter duration, and did not last more than six hours. The patient thought very light of her ailment, and seemed to think too much was made of it.

There was no return during the fortnight she remained in town, and she was able to return to the West of Ireland. Of her subsequent history I learned that she had for three years following been able to go about her place and to take moderate walking and driving exercise, though with attacks of her heart, and that finally she "died of her heart," although of the exact nature of the fatal malady I am unaware.

CASE II.—*Recurrent Paroxysmal Tachycardia*—Mrs. D., aged fifty-four, of a nervous type, without children, consulted me in

1894, and was under my care off and on from January to June, with various symptoms connected with cessation of menstruation—*e.g.*, flushings, palpitations—and she fell into flesh. She had a fresh complexion, and looked ten years younger than her age. She frequently complained of pains under the sternum, and thought, as many ladies do at that climacteric period, that her heart was diseased. I mention this because it made me pay particular attention to that organ, and I was quite satisfied that the heart was sound in every respect. I made her take active exercise, and by it and other appropriate treatment she lost a stone in weight in six months and was then in excellent health. I saw her occasionally during the next two years, looking fresh and well.

On January 7th, 1897, I was urgently summoned to see her by Dr. Byrne at 11 o'clock p.m.; she was in bed, well propped up with pillows, and though her face had a frightened, nervous expression, it did not strike me as that of grave disease. She was disinclined to speak, and evidently thought her "end was near." On taking the radial I was astonished at its rapidity; it was past counting, but the beats of the heart were over 200; Dr. Byrne thought 240. The respirations were quite easy, about 30. The lady had had some worry with her servants that day, and also had some dyspepsia. The attack was preceded by a little pain under mid-sternum.

Remembering my former case, I gave a hopeful prognosis, and the treatment suggested consisted of *sp. am. arom.*, *tinct. digitalis*, *brom. pot.*, and *infus. valerian.*

The attack lasted two hours and suddenly stopped. A second attack occurred in April, 1897, in the evening, and it was practically like the first. My friend, Surg.-Lieut.-Col. Crean (retired), happened to be spending the evening with her. He tells me that until she said the attack was on—and it was on for a couple of hours before she spoke—he noticed nothing amiss with her beyond the fact that she was a little more silent than usual, and he thought no one else in the room had observed it, as she continued to play the game of whist without comment. He did not try to count the pulse, so as to avoid unnecessary alarm, but it was very rapid. He urged her to lie down, but she felt more comfortable sitting up. "The strangest feature in the case," he writes, "was the rapidity with which the attack vanished. Within ten minutes after first feeling the pulse she quietly remarked 'it is gone now,' and the pulse had fallen to about 80."

This lady went abroad in the autumn of 1897, and spent thirteen months travelling, and visited Homburg, Rome, and the Italian Riviera. While in Nice she learned to ride a bicycle. During this time she had no return of tachycardia. Since coming home however, she has had a few attacks similar to those described, only she is not now alarmed. She told me (February, 1899) that she attributes them to slight stomach derangement and annoyance with servants, that the attack does not occur at the time of the worry, but generally at bed-time, and is always ushered in by a slight sense of pressure under the sternum. She was in good health when I saw her, and I again examined the heart and found it normal in all respects, neither dilated nor hypertrophied, and free from all adventitious sounds. She asked about cycling, and I advised her to continue the exercise.

These two cases illustrate recurrent or paroxysmal tachycardia—one in a case of pre-existent and permanent organic valvular and arterial disease; the other in an organ apparently healthy, and yet neither to be attributed to direct cardiac lesion nor followed by heart failure.

In striking contrast I now refer to Case III., where the tachycardia was persistent for 16 days, where its cause seemed to be obscurely due to an acute febrile state, and where its termination was fatal on 16th day by almost universal arterial thrombosis, and by gangrene of both lower extremities.

CASE III.—Extreme Persistent Tachycardia of 16 days duration, ending in Gangrene of the Lower Extremities—E. E., aged twenty-three, housemaid, residing at Lansdowne-road, was admitted to Sir Patrick Dun's Hospital on 17th January, 1899, after four days illness. Dr. Samuel Bradshaw, Dalkey, Co. Dublin, who sent her to hospital, stated that on the 15th he attended her for a very sore throat, with temperature 103° , pulse 140, and that next day the temperature rose to 104° . There was no evidence of either diphtheria or scarlet fever.

On admission her tongue was coated with a white fur, the tonsils, pillars of the fauces, and the pharynx were red and swollen, but were free of all exudation and ulceration. There was

very little dysphagia; there was no eruption; and she made no complaint, except of great weakness. The temperature on admission was $100\cdot4^{\circ}$, and rose at 6 p.m. to $101\cdot5^{\circ}$. The pulse was 160, respiration 32 (and very quiet), and at night 146 and 32. The urine was acid, loaded with lithates, sp. gr. 1030, and contained some albumen. With the exception of the albuminuria and the quick pulse it looked like a case of ordinary *cynanche tonsillaris*. The following day (sixth of her illness) the temperature fell to $97\cdot6^{\circ}$ in the morning, and rose to $98\cdot4^{\circ}$ in the evening. The pulse, on the other hand, rose to 200, and this high rate was maintained for the succeeding eleven days.

The following chart will best explain its course:—

Date	Temperature	Pulse	Respiration	Day of Illness
1899 Jan.				
17	M., $100\cdot4^{\circ}$ E., $101\cdot5^{\circ}$	160 146	32 32	5
18	M., $97\cdot6^{\circ}$ E., $98\cdot4^{\circ}$	200 196	— 28	6
19	M., $96\cdot4^{\circ}$ E., $96\cdot4^{\circ}$	220 216	— 32	7
20	M., 96° E., 96°	184 208	— 34	8
21	M., 97° E., $98\cdot4^{\circ}$	196 204	34 32	9
22	M., 96° E., $98\cdot2^{\circ}$	200 206	36 36	10
23	M., $97\cdot8^{\circ}$ E., $98\cdot6^{\circ}$	208 208	— 40	11
24	M., 97° E., $100\cdot2^{\circ}$	238 212	— 30	12
25	M., $100\cdot2^{\circ}$ E., 102°	226 220	34 28	13
26	M., $98\cdot4^{\circ}$ E., $100\cdot6^{\circ}$	228 220	38 38	14
27	M., 100° E., 100°	228 220	34 36	15
28	M., 100°	228	30	16

This table shows an extreme degree of tachycardia, reaching on several occasions 228, and on three, at the hour of my visit, about 11 a.m., it rose to 240 in the minute. It was by no means an easy thing to count the pulse at the wrist, but by palpation over the heart and by auscultation the rate was made out with less difficulty. The cardiac impulse was most readily felt *above* the

fifth rib. The radial vessel was very compressible and small at all times, but on the last four days it became at times imperceptible. The sounds of the heart were also very short and abrupt, the first having lost its longer and deeper natural tone. The cardiac dulness was normal. One of the most remarkable features was the *want of all consciousness* on the part of the patient of any heart trouble—palpitation, irregular action, fluttering, angina, &c.—and she was able to breathe quietly, converse, and move from side to side, and to sit up without any dyspnoea or distress. On one or two occasions she had slight vomiting of a watery nature, the bowels were easily regulated by an enema, and her sleep was fair. The treatment was chiefly expectant, though quinine and tinct. digitalis were employed, but without any effect on the heart's rate.

On 20th January (eighth day) she was feeling very much better. She was cheerful and bright, and enjoyed a cup of tea for breakfast and a light pudding for dinner. In fact to all appearance she was recovering most satisfactorily. That day the bowels moved three times, and she slept but little in the night following. Now a remarkable change for the worse took place. At the time of my visit on 21st she complained of cramps in her right leg, in the calf and the outside of the leg. Pressure of the muscles and nerves pained greatly, and she was unable to move the toes. Over the inner aspect there was diminished sensation, but cutaneous sensibility was exaggerated above a hand's breadth below the knee. Some watery extract of opium was ordered every third hour.

January 22nd.—The loss of sensation in the right leg was still more pronounced, anæsthesia being absolute from three inches below knee, while pain was acute behind the knee. The smallest movement or touch caused her to cry out. The leg presented a marbled, deep purple-red colour, measured an inch more than its fellow, and was colder than normal. About noon she had agonising and sudden pain in the calf of the *left* leg, so that she writhed in suffering, and got no relief until two half grains of morphia were hypodermically injected and the leg wrapped in hot cloths. It was noticed that the left foot was like white or yellow marble, quite cold (icy or cadaveric) and insensible to touch or pain, and motionless. Across the instep and lower tibial region small superficial veins, partly filled with blood, stood out like delicate tracery on the waxy background. No pulse could be felt in either tibial vessel.

It was plain that dry gangrene had set in, and the toes were already shrivelling up and withered. On attempting to extend the

toes or flex the ankle it was found to be stiff as the limb of a corpse in *rigor mortis*, and this was exactly the condition, since in 24 hours the joints and muscles had become supple again.

January 23rd.—The right leg, the seat of the first thrombosis, was deeper in colour, but the circulation was better established, and sensation had returned three inches lower down from the knee, while the line of demarcation was more sharply defined. On the other hand, the left leg was further affected, and the deep purple colour of the posterior parts of the calf now extended above the knee for six inches, and the internal saphenous vein was thrombosed and cordlike up to the saphenous opening. External heat kept up the temperature of the limbs, and morphia in large doses, frequently repeated, gave ease. The urine, which was acid all through, contained a large quantity of lithates, and also some albumen and blood; sp. gr. 1038. The blood and albumen increased on 25th January, and broken down corpuscles and granular *débris* were seen under the microscope, but no tube casts. There was some febrile reaction to-day—up to 100°. The left thigh measured 19 $\frac{3}{4}$ to 17 $\frac{1}{4}$ in. on the right, and from the knee down dark blotches with some dry vesicles at the ankles told that gangrenous mummification was advancing. The toes are black and dry.

January 26th.—The right leg shows improvement as to the diminished area of insensibility, as sensation to touch has extended down three inches on the outside, and a touch can be recognised almost to the inner malleolus. To-day fine crepitant râles are audible over the front of the right lung, and on January 27th they were over the left, and bloody sputa were brought up. She was not disturbed to examine the backs of the lungs. The respirations were 38 in the minute. The urine contained a little indican, and perhaps less blood, and was of a lighter colour.

January 28th.—Without further change in the general condition the patient died of asthenia. The painting [exhibited], which was taken two days before death, gives a realistic picture of the state of the lower part of each leg.

The autopsy was made by Professor O'Sullivan, Pathologist to Sir Patrick Dun's Hospital, and by Dr. Littledale, his Assistant in Trinity College, Dublin, to whom I am deeply indebted also for their most exhaustive and careful microscopical and bacteriological investigation. The following was the result:—

The *Heart* was apparently normal; the cavities contained soft clots. The myocardium was perfectly healthy, and so were the valves.

The *Vessels* of the lower extremities.—Exactly at the bifurcation of the common iliacs a dry, fine, greyish-red thrombus was found; the right common iliac contained a very small clot, but the left iliac, left femoral, and all its branches, were filled with a firm clot. No thrombosis was present in the right popliteal.

Lungs and Pleuræ.—Fine fibrinous exudation on the surface of both pleuræ, and hæmorrhagic effusion was present in the right pleural cavity. The branches of the right pulmonary artery were thrombosed, and almost the whole of the lower lobe was consolidated by infarcts of a dark red and black colour; the surface of the affected part was raised above the general level. A large infarct was in the lower lobe.

Kidneys.—The left was normal, the right contained an infarct. The liver was fatty and congested. The spleen small and pale.

There was a complete absence of any micro-organisms—cocci or bacilli—in any portion of the clots or infarcts or tissues.

The *Sciatic Nerves*.—The *left* was necrosed and would not stain, but it was free from degeneration; the *right* was healthy.

The *Spinal Cord*.—The ganglionic cells in the anterior cornua were deeply pigmented. The anterior nerve roots were degenerated on the left side, the posterior roots in both, but chiefly on the left side.

This last case presents a terribly sad picture of a condition but very rarely fatal; and naturally the question presses, Was the tachycardia of sixteen days duration the cause of this young and previously healthy woman's death? Did the rapid action of the heart, and, presumably, the imperfect emptying of the ventricles and auricles cause *ante-mortem* clotting in these chambers of the heart, and thereby induce arterial embolism—almost universal? Or, Were the tachycardia and the cardiac stagnation—alike the result of a toxin—connected with the inflammation of the throat and the primary fever which ushered in her illness? Or again, Was the tachycardia an accidental concomitant of this young woman's illness—might it have come on at any time unprovoked? and had the fatal thrombosis no closer connection than that of pure accident?

My own idea—it is but hypothetical—is that the primary fever and sore throat were of either a diphtheritic or influenzal nature; and that the “heart-hurry” was the result of toxic infection of the cardiac ganglia; that owing to the same toxic influences—as we see in diphtheria and fevers—the muscle of the heart became weakened, and the thrombi in the auricles and ventricles becoming detached caused embolism of the various arteries throughout the body, and, in particular, of the iliac and femoral arteries, which led to gangrene of both legs.

The number of cases of paroxysmal tachycardia which ended fatally are very few, and those in which *post-mortem* results are published still fewer. Brieger¹² states that of 30 cases there were but 2 in which a *post-mortem* examination was reported, and these presented entirely negative results as to its pathology.

Gibson¹³—the most recent writer on heart diseases—states there are only 6 cases which have been examined after death. It is not clear that Brieger’s two cases are included among these six—presumably not. In one there was fatty degeneration of the heart-muscle; in two there was chronic interstitial myocarditis; and in three there was cardiac dilatation. He adopts Dr. West’s view that the myocardium is the seat of the lesion, and thinks the nerve endings to be implicated, although no instance of any such condition of the nerve endings has been reported.

In this connection it is interesting to note that in my case there was a complete absence of any lesion of the myocardium.

All observers seem to think that permanent tachycardia is a forerunner of graver cardiac lesions. It can never be looked upon as a favourable sign, as it signifies arrest of the heart’s action, and leaves to be feared the development of symptoms of weakness and exhaustion.

Sudden death occurred in Sir Thomas Watson's case, also in one of Dr. Bristowe's cases, where a young man, in seemingly good health at the time, died while playing the piano.

Bouveret gives 8 deaths out of 27 cases—2 by syncope, 2 by asystolic collapse, the rest by pulmonary congestion and intestinal hæmorrhage.

I can find no record of any case of tachycardia in which gangrene of the extremities occurred.

Brieger gives one case in which thrombosis of the right jugular vein was found, and also infarction in the lungs and kidneys, but the woman, aged thirty-three, had had dropsy and heart troubles for many years, and was jaundiced when she died, and the heart was widely dilated.¹²

Balfour met a case of tachycardia in a middle-aged lady, which was preceded by severe mental emotion, and was followed by a threatening of symmetrical gangrene of the finger-tips; but from this she completely recovered.

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DR. J. W. MOORE remarked that the healthy condition of the heart, notwithstanding the symptoms during life, was notable, as the occurrence of these lesions was usually associated with

changes in the heart muscle. He believed that the diagnosis of influenza would fit in with Case III., and the tachycardia could be accounted for by the profound nervous disorder which influenza was apt to cause.

DR. W. LANGFORD SYMES in this connection read an account of a case of "thrombosis and embolism in fatty heart," which he had contributed to *The Dublin Journal of Medical Science* for 1892.

DR. KNOTT said he had an opportunity of observing an extreme case of tachycardia in a lady aged about thirty. She had always been of a neurotic temperament and suffered frequently from epileptiform convulsions. The action of the heart became often excessively rapid—so quick, in fact, that it was impossible to count the pulse.

DR. LITTLE said that genuine cases of tachycardia were comparatively rare, and those he had seen were characterised by considerable distress, thus differing from Dr. Finny's cases. He cited a case in which the patient lived for eight or nine years after the first attack. During the intervals of five or six weeks between the attacks the patient seemed perfectly well. At first no physical signs of disease of the heart could be detected, but one day he discovered a very slight diastolic aortic murmur, which increased until it became quite plain. The only thing that gave him relief was brandy. Another case was that of a lady who died suddenly during the last attack, which had lasted for twelve days. She had been ailing for five or six years, and he could detect nothing wrong with her heart. He knew of no drug which had any effect on this condition.

DR. FINNY, in reply, said the duration of cases for eight or nine years he knew to be exceeded in some instances. One of Bristowe's cases lasted for fifteen years, and in the intervals the patient was perfectly well. Brandy seemed to be the favourite drug, and he had found a cup of strong coffee or a draught of cold water often beneficial in stopping the attack.

NOTES ON POISONING BY PRIMULA OBCONICA.

By E. MacDOWEL COSGRAVE, M.D., F.R.C.P.I.;

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Physician to Cork-street Fever Hospital.

[Read in the Section of Medicine, May 19, 1899.]

THE following notes on poisoning by *primula obconica* were suggested by a case which lately came under my care. The patient, who came to see me on 23rd September, 1898, was a lady who was very fond of gardening, and had in her greenhouse some fine young plants of *primula obconica* which she tended daily. For the seven previous weeks she had had irritable red patches on the wrists and forearms, with here and there the surface broken.

The eruption came out suddenly, appearing on the wrists and lower half of the forearms within twenty-four hours. In a few days it died away from the arms, and, as it did, came out at the back and sides of the ankles; in about a month the rash recurred on the wrists and arms, and had, when I saw her, remained out for about three weeks, although the plants were no longer being tended. The rash varied in appearance—sometimes it was urticarious, sometimes eczematous, and occasionally papules formed and passed on into pustules. There were attacks of intolerable itching, and sometimes of severe neuralgic pain; and all the time, whether the rash was visible or not, the patient had epigastric uneasiness and felt sick and out of sorts.

The progress was slow; bathing the affected regions with very hot water, and the application of dilute citrine ointment giving most relief.

On glancing over Neale's Digest and recent volumes of the medical journals, and such papers as *The Garden, Gardening*, and the *Gardeners' Chronicle*, a number of references will be found to toxic symptoms following contact with primula plants.

Primula obconica was introduced into this country about 1880, and as it flowers freely all through the winter it has rapidly come into favour. It has loose umbels of pale lavender blossoms and slightly tapered leaves from whose shape it derives its specific name.

Other varieties of primula also have poisonous properties, especially *P. Sieboldii*,¹ which under the name of *cortusoides amoena* was introduced into these countries about 1864.

As these cases occur amongst those handling plants the hands are most generally affected. In my case short gloves were worn when gardening, so the wrists were the seat of the disease. With gardeners the parts of the hand least well-protected by a thickened horny layer are generally affected. Thus, Dr. Allan Jamieson² describes a case where the ball of each thumb and the back and extending to the palmar surface of some of the fingers was the seat.

When other parts are affected it may be by contact, and they are then those parts which are most easily touched by the hands. Dr. Kingsley Ackland³ records the case of a lady who had repeated attacks on her hands, and on one occasion had her chin affected.

In Dr. Clark's⁴ case the eyelids were affected from rubbing them to remove flies.

Dr. Oldacres⁵ describes a case accompanied with much swelling of the face and much œdema of the eye-lids.

Dr. Wilson,⁶ of St. Andrew's, mentions the case of a lady who suffered martyrdom with an irritable rash on her neck and chest. She was very fond of the *primula obconica*, and always wore its lavender flowers in the evening.

When the favourite flower was given up the rash disappeared.

There may be extreme sensitiveness to the poison. A lady⁷ at dinner complained of irritation of the face and nose and of the body generally; four pots of this primula were on the table, on their removal the irritation subsided. Next day the irritation recurred when the lady was in the conservatory, although she was not within six feet of the plant.

Sometimes, however, as in a case of which I have notes, the rash is general, and so its extension from the parts which touched the leaves is due not to external but internal causes.

The rash varies in appearance in accordance with the intensity of the attack. In its lightest form it is a simple dermatitis with a more or less abundant crop of small red papules.¹¹ Dr. Ackland³ speaks of it as an intensely irritable papular eruption. Cases described by Dr. Oldacres⁵ had been called by some eczema, and by others urticaria. Dr. Sym¹ describes the appearance as that of a moist eczema, papulous and excoriated.

Dr. Allan Jamieson² describes a severe case as having "well-defined hard, red, scaly areas. The edge was distinctly raised and linear, the horny layer of the epidermis ragged and undermined. The general surface of the patches, which were of considerable extent, was rough to feel, thickened, and had a tendency to fissure."

The course of the disease can best be understood by comparing the descriptions of a light and a severe case. In the former,³ in a little more than twelve hours after contact with the leaves, a broad band of small papules appeared on a raised base, and gave rise to almost intolerable itching.

In a severe case as described by Dr. Leighton⁹ the

patient was "suffering from tremendous œdema of the right hand, with well-marked lymphaginitis of right arm and tenderness in axillary glands. Next day there began a profuse serous discharge from several points on the back of the hand and from between the second and third fingers. The pain in the joints was excessive, and the patient was slightly feverish. The discharge continued for eight days, gradually decreasing.

In addition to the itching, which is generally urgent, there is often severe neuralgic pain,⁴ and frequently, as also occurred in my case, there are dyspeptic symptoms.⁵

The duration of the rash is variously described. Dr. Clark's case⁴ must have been mild, for desquamation ending in recovery took place in four or five days. In my case the skin trouble lasted several months, and in the case of a gardener, of which I have notes, it lasted a couple of years.

Tolerance is not easily established, as in a case published by Dr. Clark where some plants were brought indoors (their leaves being held aside daily whilst the roots were watered), the condition of the owner's hands became chronic. Several cases have been reported where handling the flowers after cure led to repeated attacks which showed no diminution in severity.

A troublesome symptom is the occurrence of relapses. My own case affords an example of this, and Dr. Leighton⁹ reports a case with two relapses, the time between the first and second being eight months, and between the second and third sixteen months.

Dr. Pooley¹⁰ reports a very interesting case—"A market-gardener who used *primula obconica* in making funeral wreaths did so with impunity until he got an attack of facial erysipelas (his son, who did not touch the plants, had erysipelas at the same time, which confirms this part

of the diagnosis), and got six relapses when working with the primula, the fingers also being affected." This susceptibility to primula poisoning following erysipelas is interesting.

The discovery of the cause of the attack is sometimes due to the patient being a reader of gardening papers. In a case reported by Dr. Oldacres⁵ the discovery followed indirect experiment—An old lady who suffered repeatedly from a troublesome rash and always got relief by going away from home read a letter in the *Gardeners' Chronicle*, and suspecting that her troubles might arise from the same cause gave up handling the plants, and received the benefit that had previously followed the change of air.

Direct experiment was made by a lady whose case is reported by Dr. Ackland³—"She bared her arm and lightly pressed a bunch of its leaves round the middle of the forearm. Nothing happened until the next day, more than twelve hours after the experiment, when a broad band of small papules appeared on a raised base, giving rise to almost intolerable itching."

Dr. Wilson,⁶ of St. Andrew's, examined the plant and found glandular hairs on the leaves, which he suggested as the cause of the trouble. Greenwood Pim, F.L.S., has kindly examined the hairs for me and reports—"The hairs on the leaf-stalk, flower-stalk, and mid-rib are of two kinds—one long and rather slender with six or seven septa and a slightly glandular tip, apparently, not functionally glandular; the others short, about two to three septa with a distinctly glandular tip, containing a yellowish-brown material, doubtless the irritant. The hairs are delicately striated under a high power. Those on the lamina are few and rather conical, also with aborted glands."

It is probable that the young freely growing leaves have most effect,¹¹ and possibly some plants are more virulent

than others, as generally when the disease occurs several people are affected.

Dr. Oldacres⁵ records how a lady "by way of experiment has handled the plant a few times, which has always resulted in the return of the rash and the dyspeptic symptoms. Further, two of her nephews who have been staying with her have handled the plant to test its effect upon them, and have suffered from the rash in the same way." And a gardener¹² who tried to infect himself failed, although, subsequently, when engaged in potting plants, he got a severe attack.

¹ Dr. Alan C. Sym. *British Medical Journal*, 12th November, 1898.

² W. Allan Jamieson, M.D. *British Journal of Dermatology*. 1893. Page 140.

³ C. Kingsley Ackland, L.R.C.P., Lond. *Lancet*. 1893. Page 289.

⁴ Fred. H. Clark, M.B., C.M. *British Medical Journal*, Sept. 20th, 1890.

⁵ Charles E. Oldacres, M.R.C.S. *British Medical Journal*, 3rd July, 1889.

⁶ *Lancet*, 20th September, 1890.

⁷ *The Garden*, xlix., 195.

⁸ Dr. Alan C. Sym. *British Medical Journal*, 20th September, 1890.

⁹ Gerald R. Leighton, M.B., C.M. *British Medical Journal*, 15th October, 1898.

¹⁰ E. Burdett Pooley, L.R.C.P. *Lancet*, 22nd July, 1893.

¹¹ James Ferguson, M.B., C.M. *British Medical Journal*.

¹² *The Garden*, xlviii., 195. October 25th, 1890.

THE CLINICAL FEATURES OF BERI-BERI.

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[Read in the Section of Medicine, January 27, 1899.]

THOUGH many interesting observations on the subject of beri-beri have been made public during the last few years, and though two or three learned treatises exist dealing at length with the affection in question, yet the disease retains a peculiar interest on account of its uncertain pathology, its disputed causation, its comparative rarity outside certain well-marked limits, and finally, its characteristically varied and puzzling symptomatology.

With reference to causation, my experience of beri-beri does not support any of the current theories, save the old one which associates this affection with the over-crowding of human beings into limited spaces under unfavourable hygienic conditions. The occurrence of beri-beri in the crowded quarters of Oriental towns, in hospitals and prisons, and in the crowded holds of ships has been often noted. It is difficult to see how over-crowding can act, save as a predisposing agent, but that there is some connection between the two phenomena cannot reasonably be denied. When beri-beri broke out in the Richmond Asylum, Dublin, in the year 1894, the institution had been extremely over-crowded for a great many years. The general sanitary condition of the Asylum was not good, as was shown by the prevalence of dysentery, and other zymotic diseases. The floors rarely admitted of being waxed, and consequently required constant washing, producing a dampness both of

the woodwork and of the atmosphere of the rooms, probably not wholesome.^a

With regard to the morbid anatomy of the disease and its supposed bacterial origin, I am sorry not to be in a position to add anything to the observations of former observers. The peripheral nerves of lower extremities, of the heart, and of the diaphragm were found to present parenchymatous change, and in some old standing cases the peripheral portions of the peroneal nerves presented marked interstitial proliferation and fibroid change. The changes did not seem to differ from those occurring in alcoholic neuritis. We endeavoured to make cultures from

^a The question of the dietetic origin of beri-beri receives a chiefly negative answer from our Dublin experience. There was not an excess of farinaceous food in the dietary of the Asylum. Rice was little used—less than in most private households—never, indeed, except as a “medical comfort” (*i.e.*, an extra article of diet given to some person who was sick or toothless). Meat occupied a more prominent place than in most asylum dietaries, being given six days a week—half a pound at dinner. The water supply is that common to the City of Dublin, wherein the Asylum is situated; the water is not stored; it was frequently tested and was always found free from lead or other mineral or organic poison. There was nothing supplied to the patients which is not, as far as I am aware, in common use in the city. One substance had been added to the dietary in the beginning of the year 1894—namely, dried ling, which was given for Friday’s dinner. This probably came from Newfoundland, and taken in connection with the existence of beri-beri amongst the fishermen of the Newfoundland Banks, was perhaps open to suspicion. But, apart from the fact that similar dried fish is extensively used by the poor throughout Dublin, two remarkable facts seem to absolve this dried ling. One is that in the wards where beri-beri probably first broke out, and certainly where it most prevailed, fish for certain administrative reasons had not been used at all. Another is that though the use of dried fish was stopped altogether in 1894, and fresh fish from home waters substituted, yet beri-beri returned in 1896 and subsequent years. Of course it is open to anyone who inclines to specially suspect Newfoundland dried fish to say that the substance in question was merely the carrier of the poison producing the disease, and that this poison, once introduced, multiplied according to its own laws, but that line of argument would suggest that Rangoon sugar, Java rice, nay, even frozen beef from Matto Grosso in Brazil, or many other tropical products should carry beri-beri into Europe daily.

the blood, and believed at first that we had succeeded in isolating a coccus identical with or similar to that described by Pekelharing, but subsequent trials showed that we were probably wrong. At all events, our results were not constant.

The notion that beri-beri is strictly a merely tropical disease may probably now be regarded as exploded. This I have elsewhere shown.^a

That beri-beri contracted in the tropics can continue for some time in temperate climates is evident from many records.

Lascar and other sailors are not uncommonly landed at English ports affected with this disease, and occasionally die of it in English hospitals. I have seen such cases at the Seamen's Hospital, Albert Dock, through the kindness of Dr. Manson. Within the last few weeks, through the goodness of Dr. Walter G. Smith, I had an opportunity of seeing, in Sir Patrick Dun's Hospital in this city, two cases of beri-beri in the persons of Norwegian sailors whose ships, on the return voyage from Florida with a cargo of timber, had been attacked with beri-beri, which killed the steward and invalidated a number of the crew. Manson's cases are well known, which actually broke out in the port of London among a Lascar crew, shut up in the steamy atmosphere of the hold which they never left through fear of the climate. These people probably bring with them the peculiar environment which is favourable to the development of the disease if they do not in any special way carry its poison. So that although it is true that of the many European soldiers who have returned home invalidated with this disease it is not recorded that any have served as a focus for the spread of the affection, we still cannot definitely say that this climate is fatal to beri-beri. The records of

^a "Beri-beri Occurring in Temperate Climates," Brit. Med. Journ. Sept. 24, 1898. See also Grimm's Monograph, "Klinische Beobachtungen über Beri-Beri."

the disease in Saghalien, above referred to (Grimm), confirm this opinion.

It is probably dangerous in the present state of our knowledge to circumscribe too closely the limits of endemic diseases. The history of cholera warns us that diseases can travel far from what may be called their normal habitat, and even sometimes settle permanently in distant lands. By the way, it may be that the appearance of beri-beri in Brazil is another example of the same kind, and it seems not improbable that that country has twice, at long intervals, been invaded by beri-beri, which on the first occasion gradually died out, or became inconspicuous. Now, some years after the second invasion, it would appear to be a permanent settler. It is hardly necessary to say that there is much that is still entirely unknown with regard to the spread and decline of communicable diseases locally. The spread of leprosy throughout Europe about the time of Charlemagne and the gradual process of its extinction, the commencement of which seems to date from the termination of the fifteenth century, have never been explained. The decrease and limitation of the disease cannot have been due to cleanliness, nor to effective isolation, since neither of these was understood in mediæval Europe.

There is then a possibility that beri-beri may be at present spreading or tending to spread in Europe and North America. There are certainly some grounds for thinking that it is specially liable to attack the insane in institutions. It has been suggested that the disease may have existed in these countries, and may have escaped observation among the crowded populations of workhouses, asylums, &c. It is, of course, quite possible—nay, probable—that isolated cases may occur from time to time, and fail to receive recognition, but I do not think it is possible that an extensive outbreak could long be overlooked, especially as this disease, like most similar

affections, tends when it breaks out in a new place to appear in its severer forms.

With regard to the clinical phenomena of the disease one or two preliminary remarks seem called for. The insane are unfortunately not favourable persons in whom to observe certain nervous troubles. Pain and anæsthesia, for example, are difficult to precisely confirm. A large number of the asylum patients attacked were dull epileptics, and chronic demented who could give little reliable account of themselves. The occasional concomitance of beri-beri with paralysis due to some common cause, or with diseases other than cerebral (old heart or lung affections), sometimes aided to render the precise recognition of the morbid signs of beri-beri difficult. It is interesting to note that no alteration of mental symptoms fairly attributable to beri-beri could be made out. The frequency with which we have to deal with cases of alcoholic neuritis has rendered us familiar with the mental aspects of that affection. They were looked for in our cases of beri-beri, and were not found. Neither was any appreciable change observed in the mental state of the sane who were attacked.^a The fact that the peculiar form of dysnoia which Korsakow has described as polyneuritic insanity,^b does not occur in beri-beri seems

^a Ridley (Dublin Hospital Reports, Vol. II., 1818, p. 227) tells us that when he himself suffered from beri-beri his memory became considerably impaired. This impairment of memory was one of the troubles which persisted in his case for a long time, and even after his return home. Scheube, who does not mention mental troubles in his great monograph ("Die Beri-beri Krankheit, 1894"), tells us in the article on beri-beri in his work on "The Diseases of Warm Climates" (1896) that weakness of memory, melancholia, and enlargement of the liver have often been observed as residua after beri-beri.

^b Korsakow, Archiv. f. Psychiatrie. XXI., 669. Do., do., XXXII., 112. Allg. Zeitschrift f. Psychiatrie. XLVI., 475. Do., do., XLVII., 390. Tiling, Allg. Zeitschrift f. Psych. XLVI., 233. Do., do., XLVIII., 549. Ernst Meyer, Zeitschrift für Psych. LV., 267. S. Kahlbaum, Zeitschrift f. Psych. LVI., 428. Mönkemöller, Zeitschrift f. Psych. LIV., 806. Jolly, Charité-Annalen. XXII. Buccelli, Riv. di Pathologia Nervosa e Mentale. III., 249. Soukhanoff, Revue de Médecine. 1897. No. 5.

to show that the opinion is justified, which has been held by most observers, of whom I am one—namely, that Korsakow's disease is really dependent upon the action on the cerebral cortex of certain poisons which also produce neuritis, and is not directly connected with neuritis. In a few recent cases of mental disease which were attacked with severe beri-beri which they survived, that amelioration of mental troubles occurred which is often noted as following, in similar cases, the incidence of any severe intercurrent malady. This took place notably in the cases of two acute melancholias, attacked in 1894, in both of whom mental accompanied bodily convalescence. One, an attorney's clerk, resumed his calling, which he continues to follow. The other, a militia man, who had altogether lost power of his lower extremities, served through the training of his regiment next year, and when last heard of continued in every way well. Often, of course, this favourable result did not occur. A young woman suffering from acute mania associated with pregnancy and accompanied with great excitement, contracted beri-beri in 1894 with general anasarca and severe heart trouble. While convalescent from beri-beri she was delivered of a living child. No mental improvement followed, and she has since drifted into agitated dementia quite in the ordinary way of uncured cases of mania.

Disturbances of sensation, although as might be expected often missing among the insane, are without doubt one of the earliest indications of beri-beri. They were always the first subject of complaint among the sane sufferers at the Dublin asylum. A painful sense of weariness and weight was one of the first troubles. The patient felt tired as to his legs after slight exertion or towards evening. He experienced a sensation as if the limbs were heavy. As these conditions increased they were usually accompanied

by a dull aching in the calves. Later on this aching sometimes became a prominent symptom, the pain being evidently very severe. At first, however, there was commonly no great continuous muscular pain. Cramps in the calf muscles, chiefly at night, were of early occurrence, and very often formed the immediate reason of the patient reporting himself ill. He then mentioned the weary feelings which he had perhaps experienced for some days, but which had not till now seemed to him of much consequence. The cardiac and dropsical signs may have already appeared, but not in a manner to attract the patient's notice. Numbness as a spontaneous sensation was often experienced; or numbness became evident when the patient touched anything with his foot, or in some cases with his hand. One of my head nurses, a woman of intelligence and observation, noticed amongst her earliest troubles that when she tried to ride her bicycle she could not feel the pedals with her soles, and when she wrote she could not distinctly feel her pen with her fingers.

Muscular pains, cramps, aching pains, and more rarely pains shooting down the legs, were accompanied by pains of a boring or stinging or burning character, the seat of which appeared to be chiefly in the skin. A very common complaint was that the patient felt as if stung with nettles. Occasionally special and severe pain was complained of in the soles of the feet; this was usually likened to burning. One patient said he felt as if his feet were plunged in hot lime.

The most frequent spontaneous complaint, when the disease was fully developed, and probably the most characteristic, was of a sensation as if something was creeping over a blistered surface. This feeling (painful formication) to which the Japanese observers have drawn special attention under the name of *piri-piri*, probably

belongs to the mixed order of combined hypo and hyperæsthesiæ. A certain degree of anæsthesia or hypoæsthesia, perhaps arising from a change affecting special superficially distributed filaments, produces the feeling as if the skin had been deadened or removed; while hyperæsthesia resulting from a change affecting other filaments brings about a sensation of tickling, smarting, and tingling compared to the creeping of insects, or the stinging of ants. However conditioned, this *piri-piri* is often a state of great suffering. It was extremely well marked in one of my nurses who suffered intensely from it, particularly at night.

In searching for tenderness and anæsthesia, not spontaneously complained of, some care is necessary, as a variety of conditions are found which might deceive a careless observer. The superficial nerves were always tender where sensibility could be judged at all. This was specially the case with the peroneal nerve. The saphenus in the lower third of the inside of the thigh was also very frequently tender. The calf muscles were tender on pressure. Together with this tenderness to deep pressure there were varying degrees of superficial anæsthesia or hypoæsthesia. The latter conditions were, of course, less easy to confirm in the insane than the former. A firm grasping of the calf so as to produce pressure on the muscles nearly always caused marked wincing, whereas it was often impossible, owing to the patient's mental state, to be sure as to the existence of diminution of superficial sensibility. Nevertheless, from its invariable presence in the sane sufferers and from the frequency with which it could be demonstrated in the more intelligent among the insane, I have little doubt that it always existed. It was very variable in extent and degree. It was usually associated with conditions of paræsthesia (sensations of formication and the like). Very often we

found that the patient who was insensible to light pressure (the drawing of a pencil or feather lightly over the skin) complained of pain of a formicating character when the pencil was drawn more firmly over the same area. Slighter forms of hypoæsthesia could be demonstrated by the patient's inability to distinguish whether he was being touched by a naked or gloved finger, also to recognise when a piece of stout paper was placed between his skin and the finger which touched him. The æsthesiometer was often used to demonstrate great enlargement of the tactile areas, but, on the whole, this instrument requires too much patience and intelligence on the part of the patient to be of much service. The muscular sense and the sense of temperature, so far as they could be judged, did not appear specially engaged. In the experiment mentioned above with glove and paper a keen sense would have recognised a difference between the temperature of those objects and of the finger.

A phenomenon was frequently observed among my patients which I have not found elsewhere recorded in descriptions of beri-beri—namely, the occurrence round each zone of hypoæsthesia of a very distinct zone of hyperæsthesia. Thus when the pencil passed from the region where light pressure could not be perceived, the same degree of pressure caused immediate wincing before a region was reached where sensation seemed normal, showing that the zones where sensation was lowered were bordered by tracts of tenderness.

In some cases there was very marked painful anæsthesia. The patient complained of numbness, could not appreciate the duality of two touching points, could not recognise touching objects, and yet the least touch caused pain.

Patches of cutaneous hyperæsthesia, anæsthesia, hypoæsthesia, or paræsthesia were found in various parts of

the body. In some cases alteration in cutaneous sensibility was probably almost general. More often it occurred in limited patches, sometimes corresponding to the distribution of certain cutaneous nerves, often apparently quite without such correspondence. Hypoæsthesia, with more or less paræsthesia, occurring over the legs from knee to ankle in irregular tracts, and similarly on dorsum of foot was the sensory phenomenon which was actually most commonly demonstrated (next to the practically universal tenderness of the calf muscles). Sensory troubles, whether deep or superficial, seemed always to begin in the legs. Tracts of anæsthesia were found also on the thighs, on the trunk,^a on the upper extremities, on the nucha, and on the face. Two patients—a nurse and a lunatic—presented isolated patches of anæsthesia about the lips. One nurse presented anæsthesia of the face, at first strictly unilateral and later extending towards the opposite side in the region about the mouth. It has been said that there is a special tendency in beri-beri for the sensation of the superficial tissues round the mouth to be engaged.^b In the case of the nurse above referred to this engagement involved the red border of the lips, and the patient complained that she could not properly feel her cup when she drank. Anæsthetic patches and tracts sometimes lasted for a considerable time; sometimes with little change; sometimes spreading gradually and gradually diminishing. On the other hand, when carefully watched and traced, they were

^a Including back and front of chest, sides, abdomen, and loins. Scheube observes that in his experience the back remains free. In one of my cases, patches of hypoæsthesia with paræsthesia were very well marked on the loins, lateral aspects of chest, and in the scapular and intra-scapular regions.

^b Observed as long ago as the time of Ridley (loc. cit.), emphasised by Scheube, and rightly stated by him to occur in some cases where hypoæsthesia is not widespread. Pekelharing and Winkler state that they have not met this condition.

very frequently found to vary, little or much, from day to day: sometimes they vanished with singular suddenness. The painful formication was often worse at night. On the contrary, anæsthetic patches were sometimes found to be present in the morning, and to disappear in the evening. It has been suggested that this fugacious anæsthesia is unlike that of the Eastern beri-beri, but this observation of anæsthesia present in the morning and disappearing in the evening has been recorded by Scheube in his great monograph on beri-beri, as seen by him in Japan. When this particular phenomenon was first noticed in the Dublin Asylum by one of my assistants, who was not then acquainted with Scheube's observation, the conclusion was arrived at by that officer that there had been an error in recording the diminished sensation, but the correctness of the observation was confirmed by myself in the same and in some other cases.^a

Drs. Verschuur and Eystellsteyn having pointed out to me, what I had not before noticed, that some of my cases presented anæsthesia of the pharynx—a condition which they informed me is common in Javanese beri-beri—we searched for this phenomenon, and found it in most cases in which examination could be satisfactorily carried out.^b

With regard to the condition of the reflexes, my observation coincides with those of Grimm, who emphasises the fact that so far from the abolition of the knee-jerks being a prominent feature of the disease in all stages, the knee-jerk is exaggerated, as are all the reflexes, superficial and

^a When this paper was read Dr. Littledale stated that he had independently noticed this particular condition in the Norwegian sailors suffering from beri-beri in Sir Patrick Dun's Hospital. A curious and interesting confirmation is thus afforded of the accuracy of Scheube's observation, whom almost nothing seems to have escaped.

^b It is to be observed that one of Ridley's patients (*loc. cit.*) "complained of an internal sensation of great heat, particularly in expiration, when he observed 'that his breath burned his throat.'" This condition was probably due to hyperæsthesia or paræsthesia of the larynx or pharynx.

deep, in the earlier stages. In one of my patients—a nurse in the early period of the disease—I obtained by the artifice of pressing down the patella with the left index, as the patient lay in bed with legs extended, and striking the left index with the right finger tips—a double reaction—the first a jerk following the blow immediately, and probably a direct (superficial) reflex, which was exaggerated because the whole lower limb was hyperæsthetic, and the second occurring at the usual interval of the knee-jerk, and probably representing myotatic excitability. The knee-jerk can rarely be produced by this manœuvre in normal individuals. As cases progressed the knee-jerks were usually diminished, sometimes unequally on the two sides. When there was complete loss of power they were abolished. Many cases in the first epidemic were undoubtedly not discovered in the early stage, and hence abolition of knee-jerk was then more often noted than subsequently. The circumstance that cases often do not come under notice in the first stage has, no doubt, given rise to the prevailing idea as to the knee-jerks being uniformly absent.^a

The motor like the sensory engagement was variable. The earliest symptom was a slight affection of the peroneal muscles and the flexors of the foot. In consequence the foot tended to drop and become inverted. In slighter cases this tendency showed itself in the posture of the limbs when the patient was at rest the foot being over-extended and falling inwards, yet by an effort of will the patient could rectify the condition, and the gait was little or not at all engaged. In most cases, however, the power of walking

^a Pekelharing and Winkler have noted that the knee-jerk may be much increased at the commencement of the illness, and that there may be ankle clonus. Scheube tells that in one epidemic observed by him in 1880, knee-jerk was absent in 37 per cent. of the cases; in another, in 1881, it was absent in 48 per cent.

was impaired. Some patients progressed in a hobbling, swaying fashion which they attributed to pain or to general weakness of the lower extremities. The most characteristic peculiarity of gait, and the most frequent, was an approximation more or less complete to the condition described by Charcot^a as steppage, or the gait of the stepper (high stepping horse). Here, as in similar conditions, the high action was evidently due to the difficulty of getting the drooping foot clear of the ground. This caused the knee to be raised too high, and the movement being unrestrained by the tone of the leg muscles this elevation of the knee was accomplished with a jerk. The foot was then precipitated forwards something after the fashion of the tabetic, but with this difference, that instead of the heel striking the ground first, as the foot was flopped down, the drooping toes struck first and afterwards the heel. As the patient walked bare-foot across the floor, the double impact was very evident both to the eye and ear (pseudo-tabes of Blocq).^b The patient leaned forward in walking, and when he clumsily brought his leg to the stationary point, it swayed under him. His tendency was to fall forwards, if unsupported. The maintenance of the static posture was difficult. This was partly owing to the relaxed condition of the knee-joint which wobbled with a tendency to too free backward movement, and partly to general enfeeblement of the extensors. The patient in endeavouring to support himself constantly changed his *point d'appui* from one foot to another, producing the "equilibrium of the velocipedist" of M. Grasset. All these conditions correspond to the well ascertained indications of peripheral neuritis, and may be found in the ordinary alcoholic variety. In a few of our

^a Charcot. Clinique des Maladies du Système Nerveux. Guinon. P. 270.

^b Diagnostic des affections qui ont été rapprochées cliniquement du tabes. Blocq. Gazette des Hôpitaux. 1890. No. 33.

cases of beri-beri they were presented in an exquisite form and under circumstances which rendered their study possible. In others the exact state described was more or less complicated, or in its typical form was transitory, being soon followed by increased paralysis which rendered walking impossible. In one case there was the characteristic steppage in one leg, while in the other a slight degree of lateral dragging of the whole extremity was added, producing a resemblance to the hemiplegic type. The muscles of the thigh were often paralysed. Here, as elsewhere, the extensors were first and chiefly affected. The degree of engagement was very variable. Some patients were unable to extend the knee even when lying in bed in a lateral posture. Others, though unable to walk, were able to stand so long as they could be kept in a perfectly upright attitude, but so soon as the knees were bent in the least they collapsed, owing to feebleness of the quadriceps extensor femoris. Many patients could not rise from the sitting posture without help. Some restless and maniacal, being unable to walk or stand, progressed by sitting on the floor and helping themselves along by their hands placed behind them. Some patients, made to sit up on the edge of their beds with their feet out, used to help themselves back into the supine position by leaning on their hands and swinging their hips round so as to get their legs into bed without any movement of the thigh muscles.

The trunk muscles were seldom markedly engaged, but some patients had difficulty in raising the body in bed or in sitting up, and occasionally some feebleness was noticeable in raising the head. In several patients a somewhat pendulous condition of the abdomen, probably due to impairment of the abdominal muscles, was noticeable. It will be remembered that the constipation commonly observed in beri-beri has been attributed in part to want

of power in the abdominal muscles, and Miura (quoted by Scheube) even believed that he was able to demonstrate in one case paralysis of the levator ani.

The upper extremities were much less frequently engaged than the lower. Contrary to the habit of lead, the beri-beri poison attacks preferentially the nerves of the lower extremities. In the cases at the Richmond Asylum the engagement of the upper extremities seems to have been even less than usual, but there may be an element of error here, owing to the absence of complaint in many of our people and the difficulty of testing (especially in those who do not assist one) the slighter forms of paralysis in the arms compared with the readiness with which alterations in the gait can be observed. In something less than 1 per cent. of all our cases there was actual drop wrist, and in one case this condition was extreme. In others the power of extension was impaired, and there was marked tenderness of the arm muscles.

General muscular feebleness was not uncommon, showing itself by indisposition for exertion of any kind, inability to maintain any posture of strain, and a tendency of the limbs to assume whatever position gravitation favoured. In a few extreme cases this condition passed on into a state of universal paresis, in which the patient seemed to have little power of voluntary movement of any kind.

Professor Anderson having pointed out to me that the muscles of mastication are often enfeebled in beri-beri, I made a few experiments by giving patients nuts to crack with their teeth, but obtained no satisfactory evidence of loss of power. This may have existed in many severe cases which were not tested, or in many of the earlier cases.

In one case ptosis, external strabismus, and dilatation of

the pupil occurred unilaterally. Engagement of the third nerve is a rare condition in beri-beri. Scheube does not mention its occurrence, but says he saw one case of ocular palsy affecting the external rectus, and quotes Da Silva Lima as having seen in rare cases strabismus and double vision.

On the other hand, facial paralysis, single or double, difficulty of swallowing, difficult movements of the tongue, and disturbance of articulation were not observed.

The sphincters were never paralysed in our cases.

The paralytic phenomena were not infrequently much more marked on one side than on the other. This irregularity has been observed by Scheube, who has also noted that the arm of one side and the leg of the other may be chiefly affected. This observer has also seen the paralysis confined entirely to one side, and he tells of a case in which, throughout three attacks, only the left leg was affected.

It may be mentioned that in some of our cases the sensory and dropsical phenomena like the motor showed a marked preference for one side.

The affected muscles in the earlier stage often presented a peculiar hardness to pressure. This seemed sometimes pretty uniform; more often, however, the muscular mass presented irregularities as if containing hard lumps lying in the long axis of the muscle. This was specially noted in the inner portion of the gastrocnemius (Anderson and Scheube).

As the cases progressed, atrophy of the affected muscles set in. The muscles then became wasted, soft, and flabby. *Post-mortem* their changed appearance was manifest to the naked eye, a yellowish colour taking the place of the natural colour of flesh. Degrees of change in the fibres were seen under the microscope varying from mere loss of

striation to marked granular or fatty degeneration. This atrophy of the muscles is the cause of the wasting which occurs in the so-called "dry" form of beri-beri. The disease, as my hearers are aware, has been divided by the earlier observers into two forms, the "wet" and the "dry"—meaning cases in which respectively dropsy and atrophy are predominating features. The division is very artificial and imperfect, for there is no real distinction, and a "wet" case may be found profoundly atrophic when the dropsy subsides and permits of a proper examination of the muscles. On the other hand we certainly had cases in which atrophy and paralysis appeared without dropsy having been noticed, but, considering the peculiarities of our population, and the fact that in many cases the preliminary œdema was very fugacious, I am disposed to think that œdema was always present and was sometimes overlooked, so that our atrophic cases were not truly "dry" in the sense of never having suffered from œdema.

Contractures of the lower extremities, which, though rare, are not unknown in beri-beri (Simmons, Bälz, Scheube), occurred in five of our cases. Scheube dwells upon the long and tedious nature of this condition, and tells us that in many cases it is never perfectly recovered from. Nevertheless, only two of our people remain permanently crippled from this cause, and, taking into account the difficulty of managing the insane, I think one can neither wonder at the occurrence of these contractures nor at the failure to rectify them in a few cases; for, though Scheube holds that they do not arise merely from the predominance of the flexor muscles in the long condition of inactivity imposed upon the patient, yet everyone who has much to do with the insane knows how often contractures tend to occur in lunatics who are bed-ridden from any

cause, even where there is no specific ailment of nerve and muscle.

A very remarkable condition of relaxation of the joints of the affected extremities was usually observed. Manson mentions the condition in his monograph in Davidson's "Diseases of Warm Climates," but does not dwell upon it, and I have not been able to find it referred to elsewhere in connection with beri-beri. It is nevertheless very striking. When a patient thus affected stands the knees bend in a hyperextended position to a degree quite impossible in health, and which I have not seen save in the joint affection of tabes dorsalis. The arch of the foot is lowered, and a condition of flat foot is produced which is sometimes extreme. Again, if the patient is made to lie on his face and the knees are flexed, the heel can be readily made to touch the buttock on each side, the condition of the knee-joint becoming one of sub-luxation. Similarly the ankle-joint admitted of a degree of movement quite abnormal. In many cases if one grasped the shin and shook the limb, the foot swung about with a flail-like movement. In patients lying on the face with the heels resting on the buttocks, the feet fell inwards as though the anterior ligaments of the ankle-joints had been divided. I found this condition not only in patients in whom there was marked wasting of the muscles, but also in persons whose muscles were still plump, and whose gait was little or scarcely at all affected. I therefore think it is characteristic of the disease. Whether it is sufficiently accounted for by supposing that it is due to mere loss of support dependent on deficient muscular power I do not take upon myself to say; but having seen, a few years ago, a very extreme condition similar to this, occurring in connection with the knee-joint, in a case of tabetic general paralysis in which the bones had not

undergone the changes common in Charcot's joint disease, I am inclined to think that there may be some specific trophic condition in diseases affecting the peripheral nerves, or the sensory neurons, whereby the ligamentous structures become altered. It is not due in beri-beri solely to wasting of muscles, nor does it only occur in persons long confined to bed. I demonstrated this condition in Lascar sailors whom I saw, through Dr. Manson's kindness in his wards at the Royal Albert Hospital, and in Dr. Smith's patients at Sir Patrick Dun's Hospital (see p. 147). The latter were Norwegian sailors—one elderly, the other young, both evidently strong men before the oncome of beri-beri. Neither the Lascars nor the Norwegians had been long confined to bed.

Cardiac trouble is one of the most constant conditions in beri-beri. Palpitations occurred in 60 per cent. of Anderson's cases and Scheube remarks that it is one of the most frequent subjects of complaint. All my sane patients complained either of palpitation or sense of oppression about the heart; very often of both. In one nurse palpitation was sufficiently severe and persistent to be alone a frequent cause of insomnia. On the whole, however, I would say that tachycardia and irritability of the heart are more characteristic than palpitation. Tachycardia was, I think, invariable in our cases. It was often very well-marked when other signs were not advanced. Thus a patient while lying quietly in bed would have a pulse of 100, 112, or 120, while there was no apparent distress and little sensory or motor trouble, and when dropsy could only be detected by careful examination. Even more remarkable than the rapidity of the pulse was its irritability. The least exertion was commonly followed by a singular increase of pulse rate. A patient's pulse while he lay down was 100; when he sat up it rose to 120; when he walked 20

feet it rose to 140 or 160 or higher. The acceleration which followed even the slightest exertion was very alarming, and in observing maniacal cases, in which protracted restlessness was accompanied by a pulse too fast to be counted, alarm gave place to wonder. Spontaneous variation in the pulse rate—that is, variation occurring while the patient remained in the same posture and depending on no apparent cause—was common. A curious condition which has before been noted in beri-beri, but which has not, as far as I know, received any particular name, was so common and characteristic as to deserve a special appellation. I have, therefore, proposed to call it unconformability. In this state the heart's impulse and the pulse do not correspond. The heart is acting with apparent vigour; the impulse is perhaps very distinctly visible, at any rate feels forcible to the hand laid upon the chest; the sounds are loud and the impulse conveyed by the stethoscope is strong. Yet the pulse is small, maybe extremely small, sometimes little more than perceptible. It was not uncommonly found that the pulse counted at the wrist did not correspond to the heart, some beats being apparently altogether lost or a beat being registered by the sphygmograph which was too feeble to be felt with the finger. This unconformability varies in different cases and in different stages of the same case, but it is very generally present, and one soon learns to recognise it as a prominent feature in the disease. Action of the heart, so violent as to shake the whole chest and to be noticeable as soon as one saw the patient, occurred in some cases. This condition was common in the first epidemic and in cases which terminated unfavourably. In milder cases and in the later epidemics it was by no means prominent. However, even there violent heaving action could be produced in some cases, by making the patient undergo any exertion, though it had not been evident when he was at rest.

The area of cardiac dulness was often increased, particularly towards the right. The singular phenomenon, observed in beri-beri, of a sudden increase in the area of cardiac dulness was confirmed in several of our cases.

Auscultatory signs varied. In some the normal order of the sounds was replaced by what Manson has called a pendulum sound, the sound of the tic-tac of a clock, the first and second sounds not having the ordinary relation to each other, but being about the same length, and each pair of sounds being separated from the rest by an interval of about the same length as that between the individual sounds. In many cases this tic-tac arrangement could be produced by slight exertion. Spontaneous variation of the rate and rhythm of the sounds occurred. A very common condition was accentuation of the second pulmonary sound. Reduplication of the second sound was common, producing a triple rhythm. This was most generally audible at the apex. Occasionally reduplication or "splitting" of the first sound appeared. Sometimes *bruits* were audible, mostly in the form of a soft blowing murmur with the first sound over the pulmonary area, less often at apex. These murmurs were variable and inconstant, and sometimes were only audible after exertion. Precordial anxiety was common even in slight cases, and the sense of weight and oppression about the heart was often distressing. In severe cases orthopnœa and urgent cardiac distress often ushered in the end.

Post mortem, varying degrees of dilatation especially of the right side of the heart, with or without hypertrophy, were found in acute cases. In almost all cases there was marked evidence of fatty degeneration of the heart muscle.

Respiration was usually quickened, and was often accompanied with oppression, even when there was not œdema pulmonum. In a few cases a sense of weight and constriction was complained of, somewhat like a girdle pain. These

sensations may have been due to impairment of the respiratory muscles, intercostals and diaphragm. The respiration was in some cases thoracic from feebleness of the diaphragm. In several cases paralysis of the muscles of respiration obviously contributed to the end. Sometimes, even in cases which terminated favourably, there was for some time an inability to cough deeply or to sneeze.

Impairment or even loss of voice occurred in a few cases. In one or two cases sudden death may have been due to laryngeal paralysis, but this was not proved.

A feeling of weight and discomfort in the stomach was not an infrequent complaint. The appetite was often unimpaired, even in cases of some gravity. Some of the insane ate greedily and had to be restrained from doing so as they produced sickness of stomach by over-feeding. Vomiting occurred in about 5 per cent. of all our cases. In 1894 it occurred chiefly towards the end in unfavourable cases, and this is the experience of the Japanese physicians and others, so that vomiting has come to be considered a *malum signum*. It is probable that different epidemics differ somewhat in this as in other particulars.^a In our later epidemics, vomiting had not the bad significance which it had in the first. A few cases were preceded by vomiting and sometimes also by diarrhoea. The latter, however, was rare. Generally there was a tendency to constipation throughout, especially in cases in which there was much anasarca.

In a few cases albumen was found in the urine, usually merely a trace, and generally only as a transient pheno-

^a Ridley, writing from his experiences in Ceylon, says, "the irritability of the stomach is frequently so great as to preclude the use of medicine by the mouth." Evidently vomiting was common among his patients, and had no specially bad prognostic significance. In the epidemic at Sainte-Gemmes-sur-Loire, to be presently referred to, vomiting and diarrhoea were common prodromata.

menon. The urine was apt to be scanty and concentrated in cases where dropsy was pronounced.

Œdema is one of the leading signs of beri-beri. I believe it is always present. It is sometimes slight, transitory and easily overlooked. It is perhaps correct to say, as is generally said, and as I am in the habit of saying, that it begins in the pretibial region. It is usually easily demonstrated there in early stages of the disease and in mild cases. Unlike the œdema of cardiac or renal disease it does not begin about the ankles, which are often quite unaffected, but appears along the inner side of the tibia. This peculiarity has been noted by Pekelharing and Winkler, who describe the pear-shaped swelling resulting from the peculiar situation of the œdema. Slight œdema I have found could generally be detected early over the sacrum, frequently also over the sternum or ribs and over the ulnar border of the forearm. Not seldom, even in mild cases, and where one could not say that there was general anasarca, the face was notably puffy. Sometimes the feet and legs generally became œdematous. Some cases presented general anasarca, often extreme. The dropsy of the superficial tissues presented certain peculiarities. The degree of œdema in different parts of the body seemed to vary spontaneously—that is, without any assignable cause. Thus, one day the right side would be much more water-logged than the left, next day the condition would be reversed. Also the œdema seemed to shift with altered position more rapidly and markedly than is common in other dropsical states. It also disappeared sometimes with a rapidity unknown in other affections. The foregoing remarks chiefly apply to the marked cases of anasarca with deep pitting, which were common when the disease first appeared and less frequent in the later epidemics. It has been said that the œdema

in beri-beri is more doughy than inclined to pit, that it is somewhere midway between the ordinary forms of dropsical swelling and a condition of myxœdema. This is the state found in Brazil, as I am informed by a friend who has seen beri-beri there. This is the state which I found among the beri-beri patients in the Suffolk Asylum in 1895. This state is also described by the recorders of the epidemic at Sainte-Gemmes-sur-Loire. This state did not prevail at the Richmond in 1894, but it was the more general form in which œdema appeared in the epidemics of 1896 and the subsequent years. It is particularly apt to occur in recurrent and chronic cases.

œdema of the deeper structures was often the cause of death. œdema of the lungs was common. Hydropleura was pretty constant in fatal cases and hydropericardium common. Occasionally a small quantity of effusion into the peritoneum was observed. The joints exhibited occasionally slight effusion especially the knee. Dr. Swanzy examined the fundus oculi in some cases and found the existence of œdema. *Post-mortem*, œdema of the cerebral pia-arachnoid was often marked.

I did not find electrical reactions of the service which I had hoped from the observations of Pekelharing and Winkler. This may have been in part due to the difficulty which most of my patients presented to such tests, in part to my own regrettable want of familiarity with this particular class of investigations. In some cases I could detect no electrical changes. There were many in which the changes were small. In several no abnormality was discovered except that the contractions were slow to galvanic stimulation, and the latent period long, the changes being only of a quantitative nature. Where there was marked atrophy of the muscles, reaction of degeneration was found. The electrical alterations seemed to disappear early in convalescence, and in this our observations confirm

those of Zwardemaaker and Kraft who have noted that the heart symptoms may long survive the electrical changes.

It may be well to summarise the clinical appearances and briefly refer to the general course of the cases.^a The

^aIn reading this paper I did not dwell upon the history of the various epidemics at the Richmond Asylum which was tolerably familiar to my audience. For others it is necessary to add the following:—

"History of the Several Epidemics.—The first epidemic occurred in 1894. The precise period of its outbreak is doubtful. I am sure that at first many mild cases were overlooked and many cases were misunderstood. I may perhaps be pardoned for pointing out that similar mistakes occur among those who first see beri-beri even in its recognised habitats and in a sane population." (At any rate they occurred with me.) "In the year 1894, the average daily number of patients resident in the asylum was 1,503. During the year 174 cases of beri-beri were registered; of these, 127 were male and 47 female patients. No members of the staff (sane persons) were attacked in 1894. The monthly distribution of the occurring cases showed that they increased, gradually at first and then more rapidly, from June to September, and then decreased rapidly in October, after which month no fresh cases occurred. Eighteen male and seven female patients were registered as dying from this cause. I believe that, for a reason suggested above, all these figures represent a considerable underestimate. Taking the figures as they stand, however, they show that 14·3 per cent. of those attacked died. No fresh cases occurred during the year 1895.

"In the year 1896 the daily average number of patients residents was 1,686. Beri-beri reappeared in July, and increased till September. Cases continued to occur until the end of the year. The total number attacked was 114, being 31 male and 76 female patients, with 7 (sane) nurses. Two male and 6 female patients (about 7 per cent. of those attacked) died. None of the nurses died.

"In 1897, with an average insane population of 1,800, there occurred 246 cases, 47 male and 199 female. Among these were 2 male attendants and 6 nurses (8 of the sane staff). None of the staff died. The deaths numbered 11, 3 males and 8 females (4·4 per cent. of those attacked). Four cases, which ought properly to be reckoned in the previous epidemic, occurred in January; then none occurred till June, 134 occurred in July, 50 in August, 7 in September, 3 in October, 37 in November, and 6 in December. The three epidemics show a total of 534 recorded cases, with 44 deaths (equal to 8·25 per cent.).

"The following remarks must be made: (1) It must not be forgotten that the record of 1894 is an under estimate. (2) The epidemic of 1896, extended into the following year, and would perhaps better be described as beginning in the July of 1896, and ending in the February of 1897. (3) The epidemic of 1894 attacked more males than females, as is usual with beri-beri. This proportion was reversed in the following epidemics.

"There were remarkable differences between the three epidemics. In the

affection occurred principally among the insane, solely among them at first. It was, therefore, perhaps more than usually insidious in its mode of oncome. In the same weariness in the legs with occasional cramps and breathlessness on slight exertion often preceded more definite signs for some time. Sometimes a smart rise of temperature ushered in the earlier symptoms, but this was by no means invariable, and in any case soon subsided. Grimm insists upon the frequency of this initial fever in beri-beri. Several of our patients took ill just after recovery from dysentery. Two cases commenced while the sufferers were convalescent from typhoid fever. Grimm speaks of similar cases. The disease, once started, was extremely variable in course. Some cases never passed beyond the mildest type of the abortive form (rudimentary form of Scheube). Many such cases were undoubtedly overlooked at first among an asylum population, while in later years, when they were carefully looked for, they went to swell the numbers of

first there was high mortality, *shiyo-shin* was common, there were a large number of cases of general, well-marked œdema, and motor paralysis was pronounced. In the second mortality was lower, *shiyo-shin* rare, general anasarca, though it occurred, was infrequent, and motor troubles were less marked. In the third the great majority of the cases were of that mild type which Scheube calls rudimentary; general anasarca scarcely occurred; loss of power of walking was very rare; but there was a quite special tendency to the occurrence of painful formication (*piri-piri*); yet in each of the latter epidemics there were cases—often cases of relapse—which recalled the conditions prevalent in the first. It has often been observed how much various epidemics of beri-beri differ from each other. Mortality appears to range from 2·5 per cent. (Bälz) to 74·5 per cent. (Da Silva Lima). It has often been noted that the first epidemic at any given place is the worst, and that as the disease tends to become endemic it grows milder.”—“Beri-beri Occurring in Temperate Climates.” Brit. Med. Journal, September 24, 1898.

In 1898, 13 fresh cases occurred among the female population. They were all of the rudimentary type. A number of cases hang over from 1896 and subsequent years, cases in which œdema of the legs, impairment of sensation, and tachycardia recur from time to time, especially in the summer. Mere rest in bed produces a subsidence of these conditions which are apt again to reappear when the patient is gotten up.

those affected. In such cases there was often nothing more than disinclination for walking with weariness on slight exertion, slight and often transient œdema in the pretibial region, tenderness of calf muscles with impairment of cutaneous sensation in the leg (not always to be confirmed in the insane), and some degree of tachycardia. Occasionally in such cases the degree of cardiac trouble was much in excess of the other morbid conditions, and some patients whose illness seemed trifling died suddenly. This specially occurred in the old, and in persons who had been debilitated by previous illnesses. Sometimes the course which the case ran was pretty uniform, more frequently it was very irregular. Cases which had begun mildly and had progressed favourably, often apparently merely showing the rudimentary type of the disease, suddenly became unfavourable and rapidly developed the worst symptoms. We had frequently the same experiences elsewhere described by those who have to deal with beri-beri—sudden changes for the worse in cases seemingly doing well; great frequency of relapse; occasional sudden death occurring when convalescence was believed to be progressing favourably. In connection with relapse, and also with sudden death, I may say that when we were first dealing with beri-beri I am sure harm was done by not recognising the necessity for prolonged rest in the recumbent posture. Cases were gotten up too soon. Greater caution in this respect lessened the number of relapses, and I think of deaths in the later epidemics. The duration of the disease was entirely uncertain. On the whole, the severer forms seemed to tend to terminate more quickly, whether by recovery or death, than the milder. In cases which did not maintain throughout the rudimentary type, or in such cases when they relapsed, or in cases beginning acutely, there was a general tendency for the œdema, at first only perceptible along the front of the shin, or in a few isolated places, to spread, sometimes

with great rapidity, while diminution of sensation and loss of power spread or increased concurrently. Then the dropsy abated, leaving the patient still paralysed and extremely wasted. In favourable cases paralysis and anæsthesia then gradually passed off. Alarm and distress often arose from the condition of the heart, and this organ was, as has been said, often affected disproportionately to the other symptoms. Some patients becoming more and more water-logged, or some in whom anasarca was not extreme, showed often quite suddenly extreme dyspnœa with inability to lie down, became dusky or leaden or cyanosed, exhibited violently throbbing carotids and a dilated heart, whose pulsations shook the whole chest, while a flickering pulse was hardly perceptible at the wrist. A sensation of suffocation, an intolerable feeling of oppression about the heart, gave rise to intense suffering. This condition, as has been said, sometimes set in with fulminating rapidity. It was usually ushered in by vomiting, a circumstance which has made the latter symptom of such bad omen in beri-beri. The Japanese know this state under the name of "shiyo-shin," and say that it is never recovered from. The best description of it in English is given by Anderson, who recommends relief by bleeding, and even goes so far as to suggest aspiration of the right side of the heart. The condition is obviously due principally to the failure of a weakened and probably degenerated heart to carry out the extra work thrown upon it. This is accentuated in some cases by effusion into the pericardium, by œdema of the lungs, and by impairment of the diaphragm and other respiratory muscles. Exclusive of shiyo-shin, death often appeared to be due to œdema of the lungs. Hydropleura and hydropericardium were at least contributing agents in some of our cases. Paralysis of the respiratory muscles, particularly the diaphragm, was sometimes responsible for death. Some patients seemed to die slowly of mere general exhaustion,

but in these fatty degeneration of heart muscle was usually found. Some beri-beri patients readily succumbed to intercurrent affections. In the epidemic of 1894, quite a disproportionate number of epileptic lunatics were attacked by beri-beri. This at the time I inclined to attribute to certain special unfavourable conditions existing in the epileptic wards (particularly overcrowding, &c.), but in this I was wrong, as I now believe, for the special tendency of beri-beri to attack epileptic patients has since then been noted elsewhere (Tuscaloosa and Sainte-Gemmes). Epileptic sufferers very often died in the status or immediately after a fit. Considering the strain which epileptic seizures throw upon the heart one cannot wonder at this.

Sudden death from syncope occurred in some cases, and occasionally in cases of patients who were apparently progressing to a favourable convalescence. In one such case little could be found in the heart muscle to account for the occurrence of death.

The great danger always present in beri-beri is sudden heart failure. Now how this comes about is, I think, intelligible enough if we consider the other symptoms in connection with their recognised cause. In beri-beri we find degeneration of the peripheral nerves, and we find losses of power and of sensation which we can quite definitely associate with such degeneration. Some of these latter symptoms (anæsthesia, &c.) come and go with remarkable rapidity. They disappear with such suddenness in some cases (see above) that we can scarcely suppose an alteration could be detected in the nerves engaged. But if the nerve involved instead of subserving the function of sensation in the skin of the leg or the integument round the mouth had to do with the movements of the heart or with its nutrition, it is evident that the gravest consequences might follow from what elsewhere would be a mere temporary derangement of function. Or, to look at the matter from another point

of view:—there is a form of peripheral palsy with which we are all familiar. When a man dozes in a railway carriage and through pressure on the sciatic trunk his leg “falls asleep,” we have a tolerably close reproduction of what we find in beri-beri. We have the same combination of anæsthetic and hyperæsthetic conditions. Normal sensation is abolished, but paræsthesia and painful anæsthesia are very marked. Muscular power is diminished or abolished, and attempted movement gives rise to sharp pain. Even the inability to lean upon the extremity, owing to complete relaxation of the knee-joint, is reproduced. We know the cause of this pressure neurosis. We know that it is an entirely temporary condition, but if we can imagine a condition as temporary or trivial in its essential nature occurring in the pneumogastric nerve, we see clearly that the death of the individual would result, and this because the functions of the pneumogastric nerve are such as do not admit of temporary suspension.

Reference has been made to the occurrence of beri-beri in other asylums. An epidemic broke out in the asylum at Tuscaloosa, Alabama, U.S., in the beginning of 1895, and recurred in the early autumn of 1896.^a There were altogether 71 cases of beri-beri, and 21 deaths. The epileptics suffered most severely. Some cases began suddenly with fever and gastro-intestinal trouble, some very insidiously. The symptoms and the *post-mortem* appearances leave no doubt as to the nature of the disease. A similar outbreak appears to have occurred at the Arkansas Asylum, Little Rock, Arkansas, U.S.A., towards the end of 1895.

An epidemic of beri-beri broke out in the Suffolk County Asylum, Melton, Suffolk, towards the close of 1894. I saw some of the cases in May, 1895. The affection soon after

^a Bondurant : New York Medical, Nov. 20 and 27, 1897. Here will also be found the only published reference which I know of to the Little Rock epidemic.

died out, but it reappeared in the winter of 1896. I understand there have been no recurrences since the spring of 1897.

An epidemic of extreme interest appeared at the asylum of Sainte-Gemmes-sur-Loire^a (the asylum for the department of Maine et Loire) in May, 1897. The disease began very treacherously. Attention was first drawn to its existence by an unusual mortality among the epileptics who died in the status, and whose bodies were found to present considerable anasarca. Though first appearing as a severe epidemic in 1897, it would seem that isolated cases occurred in 1896 and 1895 which were recalled when the occurrence of the epidemic of 1897 threw fresh light upon the subject. It is stated that about 150 patients suffered and 40 died. The careful descriptions given of the symptomatology and morbid anatomy leave no doubt as to the identity of the affection with beri-beri in both respects. The epidemic, however, had these peculiarities,—that gastro-intestinal troubles were unusually prevalent, and a peculiar form of erythematous eruption, somewhat recalling that of pellagra, was very general. I have heard of a case of beri-beri occurring in this country which presented the latter symptom, but nothing of the kind appeared at the Richmond Asylum. Three cases presented a transient condition of erythema nodosum, affecting the legs and lower part of thighs, appearing with the oncome of the other symptoms, and accompanied by slight fever. One case presented an eruption of large bullæ. One patient suffered from phlebitis of the cutaneous veins. In two diffuse inflammation of the highly œdematous subcutaneous areolar tissue occurred with abscess formation, and in one the appearance of traumatic cellulitis in

^a Une épidémie de paralysie ascendante chez les aliénés rappelant le beri-beri. Chantemesse et Raymond. *Annales de l'institut Pasteur*, XII., 9. Sept. 25, 1898.

one leg accompanied the appearance of neuritic conditions in the other as well as the cardiac signs of beri-beri. The last-mentioned patient relapsed twice afterwards without showing any tendency to diffuse inflammation. There is little, then, in our cases to point to any special cutaneous condition or tendency to inflammatory change in skin or subcutaneous tissues. Chantemesse and Raymond point out the remarkable fact that an epidemic visited the Sainte-Gemmes Asylum in the year 1854, and the following years, in which this erythematous eruption was a prominent feature, and which was accompanied by gastro-intestinal trouble. These epidemics have been described by Billod,^a then physician and director of the asylum, under the name of "a variety of pellagra peculiar to the insane." Billod recognised that this pellagra differed from the ordinary form, and points out that pellagra presents certain local differences at its various seats of outbreak. While drawing attention repeatedly and pointedly to the difficulty of thoroughly ascertaining physical conditions in the insane, he gives a pretty full description of various "nervous" symptoms which accompanied his cases, and seemed to him to be portion of the *tout ensemble* of pellagra. These consisted chiefly of marasmus, excessive debility and wasting. In a few cases there appear to have been contracture of the limbs, and cases are mentioned in which a condition resembling general paralysis was brought about. A certain degree of œdema of the lower limbs appears to have been very common, and sometimes there was more general dropsy. Dropsical conditions are often mentioned in the accounts of autopsies. It is mentioned in one case that walking or even standing was impossible, that the wasting was intense, and that the lower extremities were œdematous. It is true that Billod did not suspect paralysis. On the other

^a Archives Générale de Médecine, 1858. Vols. I. and II.

hand, in describing a condition which he found, or thought he found, in several cases—namely a general softening of the white matter of the spinal cord—he draws the attention of physiologists to the singular fact that so remarkable a change could occur in the spinal cord without entailing on the patients who presented it any paralysis either of movement or of sensation! Nevertheless there seem to be some grounds for believing that Chantemesse and Raymond may be correct in conjecturing that Billod's pellagra was really beri-beri, and identical with the affection which has recently visited Sainte-Gemmes. If this be not so it is strange that similar cutaneous troubles should have appeared in two distinct diseases occurring at such an interval in the same locality.

In the German asylums of Grafenberg and Alt-Scherbitz^a sporadic cases of peripheral neuritis have occurred which seem to resemble beri-beri.^b

^a Zeitschrift f. Psychiatrié. B. LV. H. 1.

^b LITERATURE OF BERI-BERI.—The best book on beri-beri is Scheube's "Die Beri-beri Krankheit," Jena, 1894—a model of accurate observation and extensive erudition. Pekelharing and Winkler's "Recherches sur la nature et la cause du Béri-béri et sur les moyens de la combattre," Utrecht, 1888, contains much valuable information. It is now accessible to the English reader in the translation by Mr. James Cantlie. Subsequent observers have not altogether borne out P. and W.'s views as to the bacteriology of the disease, which, I understand, have been relinquished even in Holland; but the clinical part of the book is excellent, and a comparison with Scheube shows the identity of the kakké of Japan with the disease observed by the Dutch in Sumatra and Java. The best English account of the disease is the full, accurate, and elegantly-written article by Dr. Patrick Manson in Davidson's "Diseases of Warm Climates." Shorter but of great excellence is Dr. Manson's notice of beri-beri in his "Handbook of Tropical Diseases." Professor Anderson's "Lectures on Kak'ké," Yokohama, 1879, are also very valuable; see also the same author in "St. Thomas' Hospital Reports," 1876. Some of the very early English writers—Mason Good, Ridley, and others—gave good descriptions of beri-beri. Then for some time our countrymen writing on this subject, generally army surgeons, were mostly led astray by the pursuit of theoretic views as to ætiology and endeavours to uphold certain opinions which might be termed official—viz., that what was called beri-beri was merely anæmia, or anchylostomiasis, or the like—and so with few exceptions produced work of little value. Grimm's "Klinische Beobachtungen

DR. WALTER SMITH said that when the diagnosis of the cases in the Richmond Asylum was first hinted at, it was scoffed at and ridiculed by some, and it was not till Dr. Patrick Manson (who was specially invited over for this purpose), Sir Thornley Stoker, and himself had prepared a report on the matter, that all doubt was set at rest. He considered that the diagnosis of beri-beri was easy only when it occurred in places where the disease might be expected, or when one was already familiar with it. Quite lately two Norwegian sailors, who came from Florida, were admitted to Sir Patrick Dun's Hospital. The main symptoms which they presented were a curious combination of motor, sensory, and trophic conditions, which he thought would be hard to fit in with any other diagnosis than that of beri-beri. They would have been labelled probably as either cases of alcoholic neuritis, or perhaps some more high-sounding name, if the disease had not already been known in Dublin. It was a singular fact that on removing patients in the earlier stages of this disease to new surroundings they were likely to recover—a thing that would not happen in the case of other infective diseases. There was no use in removing a typhus fever patient to a place where there were no other cases of the same disease, though such a procedure was of benefit to the beri-beri patient. On account of this fact Dr. Manson supported the theory that it was due to a peculiar poison which was distilled, so to speak, from the soil, the building, and the surroundings in which the patient lived, and by removing them from these surroundings they removed the cause. He thought that the most interesting point in the morbid anatomy and clinical history of the disease was the remarkable and serious interference with the neuro-muscular apparatus of the heart. The only other disease offering a pathological parallel to this was diphtheria, for in that disease, like in beri-beri, the heart was often heavily hit, and an interesting comparison might be drawn between the cardiac symptoms of these two diseases.

über Beri-beri," Berlin, 1897, is a valuable and original monograph. An immense number of papers in medical journals by various Dutch, Portuguese, German, and French authors have appeared. The Dutch and Portuguese I know only at secondhand. Among the most valuable of the German are those of Bälz, Miura, Weintraub, Wernich, Jelgersma, &c. Among the French may be mentioned Déchambre, Durand, Férís, Le Roy de Mérencourt, de Lacerda, Marie, &c. A very full bibliography is given at the end of Scheube's monograph, and this has been brought up to date in the article on beri-beri in his more recently-published "Diseases of Warm Countries" (1896). The total of works referred to by Scheube is close upon 400.



PLATE I.



PLATE II.

T. G.—*General Anasarca*.—Patient was unable to walk and progressed on his hands and buttocks, in the attitude shown in Plate II.

[From photographs.]



PLATE III.

T. G.—*Atrophic stage*, subsequent to general anasarca.

This patient (shown also in Plates I. and II.) suffered in the epidemic of 1894, and made a good recovery.

[From a photograph.]

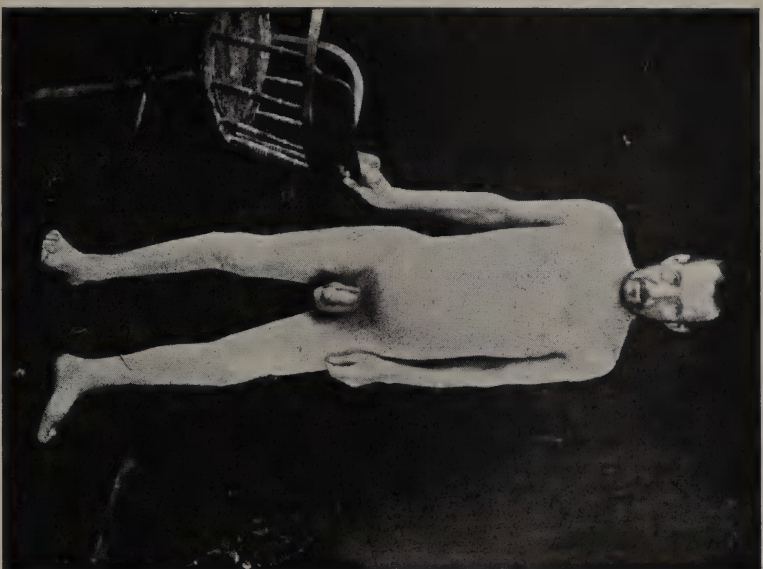


PLATE IV.

H. McK. — General œdema.

(Epidemic of 1896.)

[From a photograph.]



V.

H. McK.—Edema subsiding.



VI.

H. McK.—Edema subsided; wasting manifest.

[From photographs.]



PLATE VII.

M. B.—Patient, unable to walk, moved himself along the ground on his buttocks. Pointing of feet, and flaccidity of wasted calf muscles.

(Epidemic of 1894.)

[From a photograph.]



PLATE VIII.

O'R.—Well-marked drop-wrist; face slightly puffy; well-marked œdema of leg; drop-foot.

(Epidemic of 1894.)

[From a photograph.]



PLATE IX.

J. M.—Marked wasting of muscles in “Dry” beri-beri.

(Epidemic of 1896.)

[From a photograph.]



PLATE X.

H. S. R.—An attempt to show the “*démarche du stepper*.”

In this case there was marked but transitory œdema, followed by wasting which existed when this photograph was taken.

(Epidemic of 1896.)



PLATE XI.

J. K.—Dropped, wasted, and inverted feet and legs. The feet subsequently became contracted and fixed in this posture.

(Epidemic of 1894.)

[*From a photograph.*]



PLATE XII.

B. U.—Showing atrophy of leg muscles. There had been initial œdema, which recurred from time to time. Showing also dropped inverted feet.

(Epidemic of 1894.)

[From a photograph.]



PLATE XIII.

M. F.—Dropped, inverted feet; second toe riding; muscles wasted, yet some solid oedema of superficial tissues. Patient, who was a low type idiot incapable of speech, after exhibiting characteristic steppage, had become, when this photograph was taken, incapable of walking or standing.

(Epidemic of 1897.)



PLATE XIV.

B. B.—Third-nerve palsy ; solid œdema of legs.
(Epidemic of 1897). [From a photograph.]



PLATE XV.

M. B.—When this photograph was taken œdema was not marked. Patient could not walk nor stand without support. When she stood the knees tended to bend backwards.

(Epidemic of 1896.)



PLATE XVI.

M.D.—To show the relaxed condition of knees and ankles. The patient is as flat as possible, yet the heel having been let fall upon the buttock remains in that position; the foot also falls about under the influence of gravitation. (Epidemic of 1897).

[From a photograph.]



PLATE XVII.

M. B.—Showing drop-foot; riding 2nd toe; contracture of great toe; inversion of foot; wasting of leg.

(Same patient: epidemic of 1895.)



PLATE XVIII.

M. B.—Showing inversion of feet; tendency of 2nd toe to ride; contractures of great toe; extreme relaxation of knee-joints allowing with ease the heel to buttock posture; also wasting of calf muscles.

[From photographs.]



PLATE XIX.

L. McP.—Shows extreme relaxation of knee and ankle joints. The heels rest upon the buttocks, and the feet fall forwards under the influence of gravitation.

(Epidemic of 1896.)

[From a photograph.]



PLATE XX.

L. McP.—This photograph shows extreme atrophy of leg muscles with dropped inverted feet. Œdema was not observed as preceding atrophy when patient was first attacked in 1896. Subsequent attacks in 1897 and 1898 were ushered in by a considerable degree of solid œdema.



PLATE XXI.

L. W.—Atrophied leg muscles. Dropped inverted feet. Contracted left great toe. When this photograph was taken patient was unable to walk. She subsequently regained considerable power. Several relapses, accompanied by great œdema of the legs.

(Epidemic of 1896.)

DR. LITTLEDALE remarked that the appearance and disappearance of anæsthesia was a curious symptom. In a case he had under observation he discovered anæsthesia and analgesia over the shins and peronei muscles. On attempting to demonstrate this to a friend on the day after observing it, the patient immediately jumped on being pricked with a pin. On trying the electrical reactions in this patient he found that a current which would cause most violent contraction in his own muscles would have little or no effect on the patient.

SURGEON-GENERAL POTTER inquired if the spleen, liver, or any other organ were enlarged in any of Dr. Norman's patients.

DR. DAWSON said he had had the opportunity of examining the phrenic and vagi nerves in a few of the Richmond Asylum cases, and he found these nerves degenerated, showing the ordinary lesions of peripheral neuritis. In some cases the myelin could be seen to be breaking up into globules.

MR. CROLY, DR. KNOTT, and DR. MARTLEY also joined in the discussion.

DR. NORMAN, replying, said that Manson's opinion that the poison of the disease lurked about the soil of buildings seemed to be supported by appearances. Several writers on the subject had pointed out the seeming liability there was to an outbreak of beri-beri where the soil had been recently turned over, and this led them to think that it was a miasmatic disease. Some even had gone so far as to say that it was malaria. In answer to questions, he said that he had not found the spleen or liver enlarged in his cases. He had not noticed any change in the hair or nails. He remembered one case in which the teeth had all fallen out, but he did not think this was due to beri-beri. One patient had exhibited a series of herpetic patches, which turned into bullæ, and left little ulcers after them. There were three or four cases ushered in by a curious eruption not distinguishable by him from erythema nodosum. He could not enlighten Mr. Croly as to why beri-beri should occur chiefly in asylums in this climate, and amongst the epileptics in those institutions. He was disappointed in the use of electricity in this affection, more so, since some writers on this subject have said that it was possible to diagnosticate beri-beri before other symptoms occur by means of the electrical reactions. They had not found changes of any consequence in the spinal cord, which was disappointing, as other observers have stated that the cells in the anterior cornua were frequently found to be degenerated.

SECTION OF SURGERY.

PRESIDENTIAL ADDRESS.

By R. L. SWAN, P.R.C.S. ;

Surgeon to Steevens' Hospital ;
Surgeon to the Dublin Orthopædic Hospital.

[Delivered in the Section of Surgery, November 11, 1898.]

It is always a difficulty to select a subject to bring under the notice of a critical and learned audience. I did not feel it correct to address you on any subject in this place but on one of purely surgical interest. With all those you, of all men, are most familiar. What I have to say then will be merely a *rechauffée*, with the original piece of which you are conversant. The slender provision on the dish and the brevity of the repast will prevent repletion, and disarm even those who would exclaim "*toujours perdrix*."

The few remarks I venture to make will be on the following subjects:—

1. The influence of air on wounds.
2. The preparation of the surgeon's hands and instruments.
3. The origin of sepsis from sources over which the surgeon has no control.
4. The immunising effects of previous conditions in fortifying the patient against sepsis, and the induction of artificially produced immunity.

The Influence of Air on Wounds.—There is perhaps in the entire history of surgery nothing more interesting than the attempts to reach the truth which the story of this topic presents, a truth which was never grasped till the time of Lister, Pasteur, and Tyndall. In 1784, Benjamin Bell published a treatise in which he stated, "The bad effects of air are well known to every practitioner; but its pernicious effects on a newly opened abscess are often really

astounding.” He advised valvular incisions for the removal of cartilages in joints if quite loose, but where they are attached, and the pain is insupportable, amputation as less hazardous. Similar views are expressed in 1792 by Hugh Munro. James Latta, Edinburgh, 1795, says, “The entrance of air into abscesses is immediately followed by symptoms of putridity.” Abernethy, 1793, while holding the same views formulated a practical method of excluding air. The valvular incision in dealing with large abscesses was taught and valued by Surgeons, both English and German, for generations.

An important outcome of the idea of the bad effects of air was the introduction of subcutaneous surgery. In 1816, Delpech first performed subcutaneous tenotomy (suppuration unluckily occurred in his first case). Stromeyer published his description of subcutaneous tenotomy to exclude air in 1833; he improved on Delpech’s operation by making only one incision. The names also of Dieffenbach and Guerin were identified with this method.

Mr. William Adams in 1857 published a pamphlet advocating the subcutaneous method. He quotes the following passage from Paget, “For of the two injuries inflicted on a wound—the disturbance of the parts and the exposure to air—the latter, if continued, is the worst. Both are apt to excite inflammation, but the exposure excites it most certainly, and in the worst form—*i.e.*, in the form which most delays repair, and is most apt to endanger life.”

Various methods for the purpose of excluding air from wounds were adopted by Jules Guerin, Chassagnac, Maisonneuve, and Alphonse Guerin, and known under the general term occlusion. The last-named surgeon was well known during the siege of Paris, 1870-1, by his method of occlusion—namely, pansement ouate.

Various gases have been substituted for air in the treatment of wounds. In 1858, Demarquay and Leconte

published a paper in which they compared the relative effects of oxygen, carbonic acid and hydrogen gas.

We now arrive at the experiments of Schwann and Schröder and Deusch, which proved conclusively that air, deprived of its contained organisms by heating and filtering, produced no change in putrefactive substances by its contact. The experiments of Pasteur also showed that dust in air was the medium by which pathogenic elements were carried.

In *Nature*, January 1870, the late Professor Tyndall showed that if no dust were present in a flask, a beam of condensed light passing through it in a dark room would only be visible on each side of it, but would be invisible in its interior—*i.e.*, we see light only because there are particles in the air which render it visible.

Professor Tyndall has also demonstrated that gases arising from putrefying substances, however foul, cannot produce fermentation in fermentible liquids, although this readily occurs when ordinary dust is admitted.

The influence of atmospheric air as a means of conveying bacteria to surgical wounds, has been therefore, almost certainly proved to consist in its possession of dust particles to which the pyrogenic organisms adhere. Most of those organisms are incapable of existing without moisture, so that the infectivity of air is thereby lessened, but they have been found in large quantities in the air of inhabited rooms, and such influence cannot be neglected by the surgeon as a factor of sepsis. I was lately informed by a distinguished gynaecologist and operator that the results in the Rotunda Hospital showed a wonderful improvement (as regards sepsis) since the period of the erection of the new theatre, although aseptic precautions in other respects had undergone no change. It is probable that in other hospitals in this city, where alterations in the structure of the operating theatres have taken place, a similar result has

appeared. There is a growing disinclination among surgeons (often grounded on an unhappy experience) to operate in private houses, furnished as they are with curtains, luxuriously upholstered chairs and couches, carpets, doubtless all dust and bacteria laden. The practice which one hears and reads of so often of surgeons of eminence allowing a stream of weak antiseptic fluid to fall over the wound during operation in presumably dangerous regions, or while opening large articulations—for example, the knee-joint—illustrates that in their minds dwells an indefinite yet lurking dread of the potentialities of air for evil, as it dwelt in those of our ancestors.

The Preparation of the Surgeon's Hands and Instruments—This, as usually carried out must, I fear, lie open to a haunting doubt. I refer especially to the removal of pathogenic organisms from the integument. Welch, who has made a special study of this subject, has found more than 100 distinct species in the skin, most of them fortunately entirely harmless. All sorts of bacteria, he says, are brought in contact with the skin and exposed mucous surfaces. While the *Staphylococcus epidermidis albus*, the pyogenic cocci, and many others are constantly found in the epidermis and glandular appendages, certain dangerous saprophytic organisms may likewise find their way there, such as the anthrax bacillus or that of tetanus; the surgeon's hands may also have been quite recently infected by pyogenic bacteria.

The experiments of Dr. Leedham Green (B. M. J., 1896) appeared to show that the following methods are not to be depended on to render the hands sterile:—

Washing with brush (sterilised), soap and water, 15 mins.

Soap, brush, water, and sand, 15 minutes.

Soap, brush, water, and turpentine do.

Soap, brush, water, and alcohol do.

Soap, brush, water, and ether do.

With a solution of perchloride of mercury, 1 in 1,000, after soap and water, the results were better but not yet good. In 12 experiments with hands infected with staphylococci, 3 were sterile, 2 almost so; the remaining 7 strongly infected.

Mikulicz has been recently operating in cotton thread gloves, sterilised with the dressings, the hands also being sterilised. He has got the best results, and considers that in this way the chief defect in wound treatment of the present day has been removed. The repeated boiling of knives quite destroys them. Apart from the inconvenience, the bruising of the tissues by their use is a serious evil. Cheap knives discarded when they lose their edge is the safest practice.

But, apart from invasion of organisms from without, which may generally be combated, there are circumstances with which in the light of our knowledge we are unable to deal. All surgeons have from time to time witnessed the occurrence of destructive inflammation at the situation of an unimportant contusion, to which neither the air nor the surgeon's hands could convey infection from without. We believe now that slight injuries cause a determination of the tubercle bacillus, and indeed we seldom elicit the history of a case of caries of the spine, or hip, or knee, without some such record. These events suggest the probabilities: 1st, that the injury was the cause of the local deposition of the organisms; 2nd, that they must have been circulating in the blood-current of the individual before the determining cause arose. The first proposition, being a matter of clinical observation, is borne out by the well-known experiment of Chauveau. When he injected putrid fluid into the circulation of young rams, before crushing subcutaneously one of the testicles, the injured organ always became the seat of septic gangrene; while, without such injection, the testicle disappeared completely by absorption. Gangrene

only occurred if the fluid contained bacteria; it did not take place when the injected fluid had been sterilised by filtration. In infective osteomyelitis also, although the determining cause may be exposure to cold, a simple fracture or some other injury, the mode of access of the *Staphylococcus pyogenes aureus* is doubtful.

In an interesting article published in the latest *British Medical Journal* Mr. Treves says, "Antiseptic surgery has practically left untouched those forms of infection in which the septic element is in a certain sense introduced from within. I allude specifically to those grave and often fatal conditions of septicæmia in which the patient is poisoned by the products of decomposition in his own intestine."

When we consider that the *Staphylococcus pyogenes aureus* is found in every place men or animals congregate, on the skin of healthy persons, and the upper reaches of the mucous membrane of the alimentary and respiratory tracts, and that the *Bacterium coli commune* appears in the bowel a few hours after birth, and is found in all parts of the intestinal canal at all periods of life, that they are always ready for invasion through accidental lesions, we recognise what appears to be an easy explanation of various septic conditions—diffuse cellulitis, arthritis, osteomyelitis, peritonitis—the infection of wounds from sources quite distinct from any provided by the operator. These speculations offer for consideration the desirability of sterilising the skin, the mucous tracts, the blood itself, before formal operations. Reviewing the progressive advance of our own time, are we not justified in the hope that such triumphs may yet be accomplished?

Immunity.—Every surgeon of experience will have noticed the tolerance, as regards sepsis, of patients who have been previously suffering from the absorption of toxin products.

Last week, with the assistance of my friend Dr. E. H. Tweedy, I operated on a woman from whom I had removed the left kidney six months ago by the anterior incision. About two months before the last operation a sinus appeared at the lower part of the cicatrix. I found that this extended towards the left hypochondriac region. She displayed the usual train of symptoms commonly known as hectic—pulse rapid; jerky temperature, varying from 99 to 104°; profuse sweating. Recognising that this must not, if possible, be permitted to continue, I determined to remove the sinus by enucleation and make a posterior drain. I proceeded to do so, and, while endeavouring to separate the sinus from its adhesions, I burst into a large abscess with which the posterior extremity of the sinus communicated, which extended upwards in the vicinity of the spleen, and was filled with putrid pus. This, to my regret, gushed freely over the peritoneum and intestines. I irrigated the abdominal cavity freely, and made a large drain in the lumbar wall, invaginating the sinus into it. The next day her temperature was normal, her pulse 80, and she is now progressing favourably. I merely adduce this commonplace event as an instance of what may be termed “self-created immunity.”

Occasionally cases are seen which lead one to suspect the presence of immunity in the individual from the existence of some previous disease. About four weeks ago, a man, aged 45, fell about 50 feet from the stairs of the third landing in a lofty building into the well, while intoxicated. On admission into Steevens' Hospital, it was found that he had sustained a very severe injury of the left leg. A wound of the soft parts from the patella was seen, into which was driven a portion of his trousers, with dirt. On further examination it was found that the ligamentum patellæ was torn across. The upper extremities of the tibia and fibula were extensively comminuted, the anterior tibial artery was

torn across, and, as reaction had now occurred, was bleeding freely. This had at once to be dealt with. On exploring further, it was found that sharp splinters of bone derived from the shattered tibia projected into the knee-joint; the fingers could be freely passed into the articulation, which did not escape contamination from the clothing and dirt already alluded to. No other injury could be found; but it was discovered that the man was the subject of chronic polyarthritis deformans. Under the circumstances, amputation through the joint was considered necessary, and advised, but he refused to consent. In spite, however, of the above-named conditions, he has continued to recover steadily, with the intervention of a sharp attack of arthritis—an exacerbation of the chronic condition from which he periodically suffered. It would, of course, be as unwise as it would be absurd to formulate a theory, without the most abundant evidence to support it, but I have long observed the infrequency of suppuration in rheumatic joints, and I am not alone in that observation.

The practice of establishing immunity by the injection of anti-streptococcic serum is yet on its trial. Mr. Watson Cheyne, whose opinion must always be valued, thinks it most likely to be useful where infection by the streptococcus is likely to occur—namely, in operations about the pharynx, tonsils, and the base of the tongue. The general preparations for operation now consist of the administration of a cathartic, a period of rest, and the disinfection, as far as possible, of the alimentary canal and the wound area. An elaboration of those means by the discovery of therapeutic agencies, which would render every tissue, inaccessible as well as accessible, sterile—and which would maintain such sterility for even a limited period, would remove from the surgeon's mind most of the anxiety which besets it, and save him many disappointments and regrets.

STAB WOUNDS OF THE LEFT SHOULDER, NECES-
SITATING LIGATURE OF THE LEFT SUB-
CLAVIAN ARTERY ON THE 27TH DAY; RE-
COVERY.

By R. BOLTON M'CAUSLAND, SEN. MOD., B.A., T.C.D., M.D.;

Fellow Royal College of Surgeons;

Surgeon to Steevens' Hospital.

[Read in the Section of Surgery, November 11, 1898.]

THE operation of ligature of the second part of the subclavian artery for aneurysm has lately formed the subject of an interesting paper in the Royal Academy of Medicine in Ireland by Mr. Croly. In spite of this fact, I hope I may be pardoned for shortly recording the notes of the case which is the subject of my communication, as the operation was performed for recent stab wounds of a large vessel (probably axillary), with alarming secondary repeated hæmorrhages, after an attempt was first made to find the bleeding point.

Since my connection with Steevens' Hospital I have seen only one other case of secondary hæmorrhage, and there has been no case requiring ligature of the subclavian in any stage, nor can I find any record of when, or by whom, it was last tied in that institution.

The notes are shortly as follows:—

CASE.—J. N., aged thirty-four, a shoemaker, was stabbed by his own father, on February 16th, 1898, with a shoemaker's knife, in four places—one in the region of the deltoid insertion, one above this, a third cutting the posterior fold of the axilla, and the fourth above the collar bone on the trapezius muscle. He was brought to hospital, having lost much blood and being collapsed, but only bleeding slightly then. Owing to a mistake of the house surgeon I was not sent for, but my pupil, Mr. Quin, dressed the wounds carefully, putting in eighteen stitches, and bandaging the arm to the side.

When I saw the patient next day he was comfortable, and there was no bleeding, but he was blanched, with a quick, thready pulse. The wounds, being free from pain, were not dressed for five days. I then saw them for the first time; two were looking well, the two about the shoulder red and somewhat swollen. I removed the stitches from all. The two latter wounds gaped, one especially; no discharge of blood from any of them, and I hoped for a speedy convalescence, as the man was better, and temperature and pulse good, appetite improving. On the seventh, eighth, ninth and tenth days the dressings were blood-stained, necessitating changing. I had ice applied to the shoulder, ergot and gallic acid internally, and a special nurse day and night, and on consultation my colleague, Mr. Hamilton, agreed with me that the one wound should be plugged carefully. This was done with iodoform gauze and hazeline; also strict quiet, of course, was enjoined. The bleeding ceased for some days, and the man improved. Then the bleeding appeared again on the eighteenth, nineteenth and twenty-first days, and finally culminated in a profuse hæmorrhage on Sunday night, March 13th, the twenty-fifth day.

Dressings, nightdress, and bed-clothes were all saturated, but the hæmorrhage had ceased when the resident saw him. I was sent for, and I had the wound carefully dressed, a morphin hypodermic $\frac{1}{3}$ grain, ergot $\mathfrak{z}\text{i}$, and strychnin $\frac{1}{20}$ grain, administered, saline salt solution by the rectum, lots of ice applied, and quiet. Next morning I had a consultation, but decided to wait a day, as the man was in a very weak state. On Tuesday morning my colleagues, Mr. Hamilton and Mr. Swan, saw him with me. He was better, and had rallied, but it was evident something more energetic should be done.

Three operations seemed to suggest themselves to me:—*(a)* Amputation at the shoulder-joint; *(b)* ligature of the subclavian; *(c)* to enlarge the wound and look for the bleeding vessel.

Ligature of the axillary artery, in the first stages, is not an operation that recommends itself to me; and the third stage was out of the question, as the arm was very fixed to the side, and there was an unhealthy wound, not healed, in the axilla itself to complicate matters. Ligature of the subclavian seemed to me most preferable; but as there was a large swelling over the scapular region, evidently breaking down blood-clot, my colleagues advised the third proceeding first, and I now think that they were right.

Under an anæsthetic I freely enlarged the opening, giving exit to a large quantity of blood-clot; an unhealthy opening came into view with a small soft clot leading down towards the head of the humerus. The finger could sweep round this clot; I removed some of it, and the part that remained pulsated more and more the deeper one got in the dissection. I still kept enlarging the wound cautiously, and could feel the neck of the scapula to the inner side, but no bone outside, only what seemed to be muscular bands.

I considered the wounded artery was the subscapular, or more likely the axillary itself—(a) From the direction of the original stab; (b) from the sudden, rapid, and large amount of the hæmorrhages.

I feared to enlarge the wound more, it was so deep and unhealthy-looking, so I asked my colleagues to examine it. As Mr. Hamilton was feeling the clot it became dislodged, and on withdrawing his finger a copious gush of blood spurted out. I immediately thrust my fingers into the wound, which effectually plugged it. Mr. Swan made for me a long compress soaked in turpentine, which I cautiously pressed in to replace my fingers, and packed some more of the same compresses in on top, and put three deep, strong, silkworm-gut sutures in to keep all in place.

The man was now turned on his back, and the subclavian region was rapidly washed and disinfected, as were also our hands. An incision was made along the clavicle from outer edge of sterno-mastoid to anterior edge of the trapezius; this was enlarged a little later, and the edge of the sterno-mastoid cut; nothing of importance appeared, and the operation was rapidly proceeded with. Two small vessels were for a time clipped, a large artery (*transversalis coli*) and the omohyoid were seen and drawn upwards. The lower cord of the plexus was seen and at once recognised from its direction; the tubercle on the first rib was badly marked; the subclavian vein was in the lower part of the wound, alternately filling and emptying; and the artery at times pulsated visibly, then again not at all.

When the scalene edge was fully made out and the vessel cleaned I passed a fully-curved aneurysm needle from above backwards, downwards, inwards, and forwards quite easily round the artery: this was threaded with three single silk ligatures, No. 3, that had been boiling, and these drawn back again.

These were altogether drawn tight in a single knot, and fastened in a single reef knot, and the ends cut short. Pulsation was now visible up to the knot, but none beyond it. The ligature was drawn tight, but no sense of the coats having given way was experienced.

The wound was irrigated with carbolic lotion, 1 in 20, and then hot sterilised water, dusted with boric powder, the edges accurately adjusted with silkworm-gut and horse-hair, sterilised compresses and cellulose applied, and the arm wrapped up in wadding and flannel bandages. The left arm and forearm had been swollen and œdematous for some days past, and the pulse had been with difficulty felt; none, however, was felt after the ligature was applied.

The operations had taken two and a quarter hours, and the man had borne them well, but I gave him a hypodermic of morphin, $\frac{1}{4}$ gr., and strychnin, $\frac{1}{20}$; these rallied him well. To shorten the notes, I may say the man went on well until Thursday morning, about 3 a.m., when he became delirious; morphin and bromides freely given, and ice to the head, did not seem to have any effect. His violence, tossing about and shouting, was extreme, and his strength very great—surprising after all he had gone through, and causing me to fear giving way of the ligature, hæmorrhage, opening up of the two wounds, and other numerous complications.

Some surgeons, who were at the hospital that day to see another operation, both heard his shouts and saw him with me. Some thought it was alcoholic delirium, but I did not think so. Mr. Bennett, our consulting surgeon, advised opium enemata, two of which he got. With difficulty I removed the plugs from the posterior wound, irrigated it, and dressed it lightly with iodoform gauze; no bleeding from it at any time, and it has been dressed once daily ever since; it granulated rapidly, and was finally healed on May 5th. The delirium passed away in nine and a half hours, as rapidly as it came on, and he has had no return of it since.

The subclavian wound was dressed first on the 8th day—it was dry and completely healed, except where one stitch had slipped, and there was a dry scab one-third inch long on that spot; all the stitches were removed, and it was only dressed twice since then, though a firm pad was kept constantly on it. The patient's temperature fell to normal the second day after operation, and has

remained so, with the exception of a few trivial rises due to confined bowels—always a trouble with him. He had one slight rigor fifth day after operation, the cause of which I could not make out; it was followed by no new signs and symptoms and no increase of old ones.

Pain, with exacerbations at times in the deltoid region, forearm and hand, which he had complained of since he was stabbed, was his only troublesome symptom after operation; this was treated by morphin hypodermics when excessive, and by gentle rubbing and massage later on when permissible.

In the second and third weeks after operation, pains in the hand and shoulder were most severe, due, I thought, to vascular alterations.

After operation the œdema in the limb rapidly subsided, but no pulsation was felt in any part of it until the thirty-fourth day after operation, when the radial only was felt feebly pulsating. His appetite increased gradually; he asked leave to smoke on the fourteenth day (after operation), and was allowed up out of bed on the twenty-fifth day. With massage and more freedom of movement allowed, the limb is daily improving, and the pains are not so severe as they were.

My best thanks are due to my colleagues for their experienced advice and assistance, and also my thanks are due to Mr. Quin, my dresser, and those nurses whose unremitting care and attention tended towards the recovery of this most anxious case.

I have had the honour of showing the patient to members of the Surgical Section of the Royal Academy of Medicine in Ireland.

MR. HENRY GRAY CROLY said the question of difficulty in such a case was whether one should not at the time cut down and seek for the bleeding vessel. That applied to all regions of the body. He would be disposed, in case of a stab in the neck,

with severe arterial hæmorrhage, not to trust to pressure, but rather to enlarge the wound and seek for the bleeding points. Guthrie laid down that any treatment except cutting down and tying the divided ends is surgical absurdity. Stabs at the bend of the elbow, where compression and digital pressure were applied, generally resulted in secondary hæmorrhage, laying open the wound, looking in a placental-like mass for a cut artery—an operation of extreme difficulty. The same applied to wounds of arteries in the vicinity of the wrist.

MR. T. MYLES considered the question as to what is the best method of treatment, when hæmorrhage which may be fatal occurs as the result of a wound or a lesion, of paramount importance. It is generally accepted that in cases where the hæmorrhage from a wound had ceased that the Guthrie rule of exposing the wounded vessel may be held in abeyance; and he thought that, on the whole, this is fairly justifiable, but is subject to certain limitations. Amongst the circumstances governing it he thought that one was the extent and severity of the previous hæmorrhage and the capacity of the individual to withstand more hæmorrhage. If this case had had much hæmorrhage it would not have been good to allow him have the chance of much further hæmorrhage. If the cessation of hæmorrhage is not due to weakness of the heart, then, he thought, that any surgeon would be justified in postponing the operation and waiting for further developments. Everyone knew that every hour which intervened between the original onset of the hæmorrhage and the time of exposure increases the danger and the unjustifiability of the operation.

MR. CHANCE had found ligature of the third stage of the sub-clavian a very difficult operation. He had performed it in order to starve a large sarcoma of the axilla. Undoubtedly, when an artery is divided, if it can be tied at the seat of division, it is the ideal operation, no matter at what period it is done.

MR. LENTAIGNE referred to the success which attended the ligation of arteries now-a-days as compared with that in the old septic days. He agreed with the majority of Mr. Myles' remarks, that the artery should be cut down on and tied, especially with the dictum that when the hæmorrhage has ceased from failure of the heart's action from a very weakened patient, the bleeding artery should be cut down on at once at seat of injury.

MR. M'CAUSLAND, in reply, said that the wounds from which the bleeding came were not situated in the neck. If there was

decided arterial hæmorrhage, he agreed with Mr. Croly that the proper course would be to cut down on the vessel and tie it at once. In answer to Mr. Myles, he said that the stopping of the hæmorrhage in the first instance was not due to failure of the heart. Much blood was lost; but, on the following day after the stab, he did not think that it was a very large vessel which was wounded, as otherwise he would have cut down on the artery and ligatured it. Bleeding did not occur on the 4th or 5th days, but the dressings became blood-stained on 7th, 8th, 9th, and 10th days. He agreed with Mr. Chance in his remarks.

COXA VARA.

By SIR THORNLEY STOKER, F.R.C.S.;

Surgeon to the Richmend Hospital, Dublin.

[Read in the Section of Surgery, November 11, 1898.]

As the condition of coxa vara is one so recently described and as yet so little studied that its name may convey no clear idea of its nature, I shall, perhaps, be excused for commencing by a definition of its circumstance, and for saying that the disease with which it has previously been confused, and from which it is most important to diagnose it, is morbus coxæ.

It is a bending downwards of the head of the femur, due to curvature of its neck, so that the head of the bone is nearly as low as, or even lower than, the top of the great trochanter. The bending of the neck is such that it is convex upwards and forwards. The deformity is usually due to rachitis, and is probably a common disorder, although it has but recently been described. Its discovery ranks in importance and novelty with that of post-nasal adenoids by Meyer, of Copenhagen, in 1868, and just as these vegetations are easily recognised and treated now that an original observer has taught us how to look for them, so we may see many examples of coxa vara now that we have been educated as to its existence. There is this difference between the two discoveries: that whereas Meyer gave us in the beginning comparatively full information of the nature and treatment of adenoids, and left but little room for further observers, the discovery of the diseased condition now under consideration, although followed by some information about its diagnosis and treatment, still leaves room for an increase of our knowledge concerning it.

Coxa vara was first discovered so late as 1889 by Ernst Müller, and was more fully investigated and described in 1894 by Hofmeister, of Tübingen, who gave it its name. So far as I know the condition was first introduced to the notice of British surgeons by Professor Ogston, of Aberdeen.^a It is interesting to note that he says he "had previously for several years been collecting records and photographs of this condition under the designation of rachitic deformity of the head and neck of the thigh bone," when he found that Hofmeister had also been at work, and had published his results. Professor Ogston's article, however, threw new and original light on the subject, and since the time of its appearance the diagnosis, previously difficult and largely conjectural, has by the introduction of the Roentgen rays been made quite exact.

NATURE OF THE DEFORMITY.

The angle of junction of the neck with the shaft of the normal femur varies with age, being more obtuse in early life and approaching more nearly to a right angle as age advances. Thus, in a young adult it is about 128° , in a child is much larger and more open, while in those of advanced years only does it ever approach a right angle.

As regards the deformity of coxa vara, it is a condition where the head of the femur may be so depressed that it is below the level of the top of the great trochanter, and that the neck may form an angle with the shaft of even less than 90° . In minor varieties of the deformity it may occupy any level between this and the normal elevation, which of course varies with age, the head being higher in proportion to the youth of the subject and the obtuseness of the angle of junction of the neck with the shaft. Also the neck is curved in such a way that its anterior convexity is much

^a Practitioner. April, 1896.

increased. To the first of these conditions is due the shortening of the limb, which is a characteristic sign; and to the second the eversion of the extremity, which is even more remarkable. The greater the depression of the head the more the shortening; the greater the anterior convexity of the neck the more the eversion. *Coxa vara* is generally unilateral, although cases have been seen where it has been present on both sides, as in the illustration here appended, which is taken from a rickety skeleton in the museum of the Royal College of Surgeons in Ireland. I am not aware that any record has as yet been made of the side on which it generally occurs, but mechanically judged it should appear more often on the left side than the right, as in the bulk of persons who are right-handed the chief weight is commonly thrown on the left hip.

CAUSES.

Of causes, the most usual is rickets in young children, and osteomalacia after puberty or in early adult life. Occupation is necessarily a factor of provocation, and that those employments which keep the sufferer on his feet are most injurious will be understood when we remember that, taking its mechanical position together with the superincumbent weight it has to bear into consideration, it is probable that the neck of the femur is proportionately more severely strained than any other bony point in the skeleton. Given, then, a femoral neck softened and made less resisting by disease, the mechanism of the deformity is readily explained. The convexity of the neck in an upward and forward direction is an example of the law usually observed in rickety bones that the bend is an exaggeration of the normal curvature governed by the line of greatest pressure.

Softening of the bone due to inflammation, tuberculous or simple, has also been assigned as a cause of this complaint,

and it is particularly necessary to remember this in connection with the explanation of certain mixed cases I have observed, and in which it is not possible to eliminate altogether the existence of morbus coxae.



Sex seems to be a factor in the production of coxa vara, as it is more usually seen in males. Having in view the greater obliquity of the shaft of the femur in the female as

contrasted with the male, and the therefore more vertical direction of the axis of the neck in the former sex, and also having regard to the comparative shortness of the neck in the female, this sexual proportion is what we should expect to find, as the neck in females, being shorter, is proportionately stronger, and being more vertical is more in the axis of pressure, and therefore for both reasons better able to sustain its burden without yielding.

DIAGNOSIS.

The question of the symptoms and signs of coxa vara, and its diagnosis from conditions resembling it, is an important one, and doubly interesting because it is only in process of elucidation. As it is not a condition dangerous in itself to life, and as the most common of those with which it may be confounded—namely, *morbus coxæ*—is highly dangerous, the diagnosis is of the more moment.

As usual, in the case of a newly-described complaint, some persons seem to exhaust themselves on classification, even before the diagnostic evidences are thoroughly laid down. I find the following four varieties mentioned: (1) Congenital; (2) infantile; (3) coxa vara adolescentium; (4) coxa vara of adults.

We need scarcely in the present stage of our knowledge trouble ourselves by attempts to separate these forms very exactly. They all present certain features more or less common, dependent on bony deformity, and their further differentiation lies in the recognition of the age at which they occur and the general circumstances of their causation. Thus the first and second are probably always due to rachitis, and the ordinary historic evidences of that disease are found. The third may be rachitic or due to inflammatory softening, tuberculous or simple; whilst the fourth is almost necessarily the result of osteomalacia.

Let us examine the evidences of disease common to all forms, whether of infancy, puberty, or adult life, and leave the separation into the divisions named to be effected by a consideration of the age at which a particular case occurs and the constitutional conditions present.

Suffice it to say in this context that what I may call "true" coxa vara is that dependent on rickets, and that it may be seen at any time between 3 and 18 years of age. It has been said that 13 to 18 is the limit, but I have seen one case at $3\frac{1}{2}$ years of age, whilst the oldest I have noted was 17. That it is not noticed before 3 or 4 years of age is what might be expected, for it is about the period of infant life that extreme activity begins to develop.

The following are the signs and symptoms as yet recorded of this complaint:—

1. The gradual onset of lameness between the ages mentioned.
2. Of pain referred to the knee.
3. Shortening varying from $\frac{1}{4}$ to $2\frac{1}{2}$ inches.
4. Lessened range of motion of the hip particularly in the direction of abduction.
5. Eversion nearly always present.
6. Adduction, but usually no power to transadduct.
7. Trochanter moves in its normal arc.
8. Range of rotation of joint is lessened.
9. No visible swelling or marked wasting or obliteration of gluteal fold in the early stages of the disease (Ogston).
10. When the hip is flexed beyond the point where the foot touches the knee of the opposite side, rotation of the thigh outward takes place, so as to cross the extremity in "tailor's fashion."^a
11. Thomas's test if applied in a case of coxa vara will allow the popliteal surface to come into contact with the table.

^a See Mr. Lacy Firth in British Medical Journal, November 5th, 1898.

12. The final and unanswerable test is the application of the Roentgen rays if a skiagraph can be successfully taken.

While it is to be remembered that few of these conditions are absolutely constant, and that, as Mr. Muirhead Little lately remarked, no symptoms are in themselves pathognomonic (from which statement we must, of course, except the evidence of the Roentgen rays); yet if these signs be contrasted with those of early morbus coxæ they will generally lead to a correct diagnosis when studied *in globo*. An analysis of the foregoing list of signs and symptoms, and a comparison of them with the conditions present in morbus coxæ, will show that the chief differences in the two complaints are as follows:—

2. *Pain*.—This is referred to the knee, but I believe I have observed a difference which usually exists between the pain of morbus coxæ and that of coxa vara. While the former is referred to the back or inside of the knee, the latter is complained of in front of that joint. This is due to the fact that whereas the pain in morbus coxæ is carried by the genicular branch of the obturator which enters the knee from behind, that in coxa vara is conducted by the anterior crural, which, giving a filament from its deep division to the hip, afterwards supplies the front of the knee. It is probable that the increased anterior convexity of the neck in coxa vara exerts some pressure on, or irritation of, the anterior crural, and accounts for this variation.

3. *Shortening* is absent in the earliest stage of morbus coxæ when the difficulty of diagnosis is greatest. In the late stages of either disease no difficulty of forming an opinion should exist.

4. *Abduction* is a prominent sign in the early stage of morbus coxæ, and later on, when adduction takes place, it is accompanied by inversion.

5, 6. *Eversion* combined with adduction are never present in morbus coxæ in its early stage when the diagnostic diffi-

culty arises (Hofmeister and Ogston). Transadduction is common in the late stage of morbus coxæ, is not present in coxa vara.

7. *The arc of movement of the trochanter* is diminished in morbus coxæ.

9. *Swelling of the joint*, with wasting of the muscles of the thigh and obliteration of the gluteal fold, are evident in early morbus coxæ.

10. *The "tailor" rotation* is not found in morbus coxæ.

11. *Thomas's test*, if applied in morbus coxæ, will not allow the popliteal surface to rest on the table.

Table to Facilitate the Differential Diagnosis of Morbus Coxæ and Coxa Vara.

Symptoms and Signs of Coxa Vara	Symptoms and Signs	Symptoms and Signs of Morbus Coxæ
	<i>Common to Both.</i>	
Less marked - -	Lameness -	More marked.
Referred to front of knee	Pain -	Referred to back or inside of knee.
Present at first	Shortening	Not present at first.
With adduction	Eversion	With early abduction only.
Lessened - -	Rotation -	Lessened.
	<i>Not Common.</i>	
No tenderness -	—	Tenderness.
Adduction; no trans-adduction	—	Abduction in early stage.
No inversion - -	—	Inversion in late stage.
Trochanter moves in normal arc	—	Arc of movement lessened.
No swelling, wasting of thigh, or obliteration of gluteal fold in early stage	—	Swelling of hip, wasting of thigh, and obliteration of gluteal fold.
"Tailor's" rotation present	—	"Tailor's" rotation absent.
Thomas's test negative	—	Thomas's test positive.
Skiagraph shows deformed neck	—	Skiagraph shows no deformity of neck.

It is not out of place to mention that of the three methods of measurement usually pursued: (1) From the anterior superior spine of ilium to patella; (2) the application of Nélaton's line; and (3) of Bryant's triangle, the latter is much the most exact and efficacious. It not only measures shortening better by its vertical side, but by its horizontal side gives an exact comparison of the degree of eversion as contrasted with the opposite limb.^a

The various conditions which may be mistaken for coxa vara are as follows:

1. Morbus coxæ.
2. Congenital dislocation.
3. Other dislocations.
4. Fracture.
5. Upward enlargement of the acetabulum.
6. Rachitic curve of the upper end of the shaft of femur.

Of the first of these I have said enough, and with the rest it is not necessary specially to deal at present. The Roentgen rays will generally distinguish them from each other and from coxa vara, and if this method be not procurable, or should prove inefficient, an ordinary knowledge of surgical acts and principles will render diagnosis sufficiently easy.

ILLUSTRATIVE CASES.

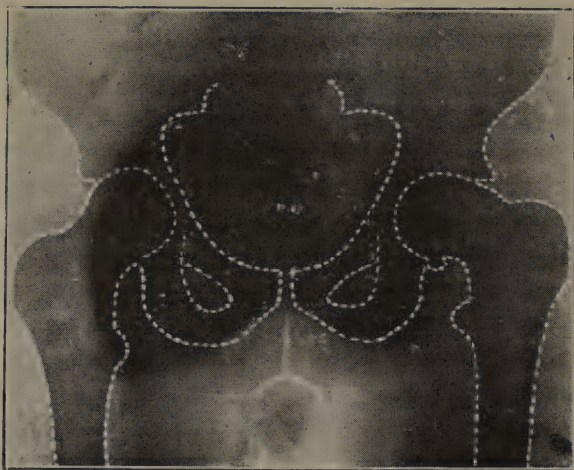
Nothing can be more instructive as to the necessity for learning to see or more illustrative of how we may fail to perceive plain things, than the late discovery which has taken place of coxa vara. At the same time we are consoled for our past blindness by the recollection of the unknown surgical lands which, inferentially, lie open to our exploration in future. I have for many years been looking at cases of what I considered to be early morbus coxæ, in which recovery with a little shortening took place; it has even

^aOgston. *Loc. cit.*

been possible to explain them to one's own satisfaction by speaking of "a resolution of inflammation" and "a quiet absorption of part of the femoral head" or of "an arrest of development" in the neck consequent on disease. These vague pathological phrases have a somewhat narcotic and comforting effect on our surgical anxieties, but they are empty sounds, and that they often signify nothing is amply shown by the history, or want of history, of the disease under consideration. We can now recognise most of these cases as ones of coxa vara, and think with wonder, and a little mortification, of our blindness.

Since April, 1896, I have identified at least eight cases of coxa vara, of which two were in girls, aged respectively 5 and 14 years, the rest were males. My youngest patient was a boy, aged $3\frac{1}{2}$ years, the eldest a lad aged 17 years, the others being of various intermediate ages. The shortening in the youngest child was one-third of an inch, and in the eldest lad three-quarters of an inch.

The skiagraph here given, which shows the disease in the



right femur as seen from behind, is that of the latter case, and as the deformity is made so evident by comparison of the two sides, in spite of the moderate amount of shortening, it affords an excellent example of the value of this method of investigation. The greatest shortening I have seen was $1\frac{1}{4}$ inch. All these cases have so far done well—that is to say, the deforming process seems to have been stayed by treatment, and in two instances only have untoward circumstances shown themselves.

In one of these, that of the child aged $3\frac{1}{2}$ years, periarticular suppuration followed an exacerbation of acute inflammation about the hip, and required incision, erasion, and free drainage. When I had cut down on the joint by an anterior incision I had the opportunity of examining it with the finger and finding, as I had anticipated from its relative freedom of movement, and from the knowledge gained in the earlier stage of the case by the use of the Roentgen rays, that the articulation itself was safe, and moved with smoothness and sufficient freedom. The child has since done well, is free from constitutional disturbance, and is able to get about very actively.

The second of the two cases is that of a female child who having at the age of 4 years shown evidences of coxa vara, was seen by me in consultation with Mr. Coppinger. When 5 years of age she developed acute inflammation about the hip-joint, for which I again saw her. Had I not had a previous knowledge of the case and been fortified by the opinion of Mr. Coppinger, who agreed with me that it was coxa vara, I should have unhesitatingly set it down when in the acute condition as one of morbus coxæ. In result it suppurated some months after the acute symptoms had shown themselves, but the child is now in good general health and able to get about with the aid of Thomas's splint.

These two cases are of the variety I have referred to as "mixed" in character, and are examples of an inflammation,

probably tuberculous, grafted on to coxa vara. When we have regard to the usual exciting causes of active tuberculous disease, nothing seems more reasonable than to suppose such an excitation might be afforded by rickety disease of a neighbouring structure. It is cases of this mixed class that offer most difficulty of diagnosis, because, in fact, we have morbus coxæ of a kind grafted on to the original deformity, and it is in the examination of such instances that the skiagraph finds its best purpose, and shows at once whether rickety deformity lies behind the inflammatory condition.

As the use of the Roentgen rays has not yet attained its full development, we may expect even clearer results from this method after a time. In order to obtain a good picture the hip requires a long exposure, trying to young children. I cannot touch this part of my subject without making my warmest acknowledgment to Dr. Lane Joynt for the untiring and skilful help he has given me in procuring skiagraphs of some of these cases. He took one so far back as May, 1897. The glass picture often shows to a trained observer features not discernible in the paper print, and Dr. Joynt has therefore applied his training in strengthening by dotted outlines the features best seen on the glass, so as to make the print as instructive as possible. The skiagraphs have heretofore been done from a single Crooke's tube suspended in front of the pubes, and thus the illumination of each hip is obtained obliquely from before, backwards and outwards. This introduces an element of perspective which renders the skiagraph difficult to read, and which makes the comparison of the right and left joints less exact and striking. A method of taking the skiagraph of each joint in a direct antero-posterior line would be an advantage.

TREATMENT.

The treatment of rachitic coxa vara does not involve any problems except in its more grave varieties. When the

deformity is but slight and the lameness incipient, attention must be given to the ordinary matters that govern our treatment of rickets. The exhibition of cod-liver oil or phosphorus, with lime salts and perhaps iron, are, together with suitable feeding, the principal means of general therapeusis. In order to prevent increase of the deformity it may be necessary to keep the patient from much walking or standing, taking care to draw the line at an amount of confinement which would impair the general health. In order to procure extension and rest a Thomas's splint may be applied; but, if it be used, its employment ought not to be pressed to such an extent that it may, by throwing too great a strain on the sound femur, induce a similar deformity in it.

It seems to me that, for such children as can have it, riding on a donkey or pony is the best form of exercise. It avoids much weight being thrown on the femur, and if long stirrups are used may even help, by the wide separation of the shafts of the femora, to lessen the deformity by bearing on and thus tending to increase the angle of junction of the neck of the bone. In cases of female children they must ride cross-saddle.

Where the deformity is extreme operation has been recommended. Kraske has proposed to expose the front of the neck at its junction with the shaft by an incision about two inches long, extending from above and inside the great trochanter downwards along the inside of the tensor vaginæ femoris. The anterior intertrochanteric line being thus brought into view, the periosteum and fibrous attachments are pushed off the outer extremity of the neck, and a wedge removed with the osteotome from its base, dividing the bone at this point. A linear osteotomy of the neck at the same point, without removal of any of its substance, has also been recommended, and seems a more simple and safer operation.

Subtrochanteric osteotomy of the shaft has also been pro-

posed, and it is claimed for it^a that it is an operation capable of also dealing with that curvature of the upper portion of the shaft which may be mistaken for coxa vara or associated with it. I have not as yet found a case of enough gravity to demand any form of osteotomy, nor do I think, from what I have seen, that such instances are likely to prove common. If osteotomy be called for and performed, the thigh must be forced into good position, and so retained until union has taken place.

MR. R. L. SWAN said that he did not think that any practical surgeon would mistake morbus coxæ for coxa vara in infants or children, as coxa vara is a symptom of rachitis, and there would be other conditions, he thought, to mark the difference. For instance, in coxa vara there are no night cries; in morbus coxæ rotation invariably elicits great pain, but not in coxa vara. He thought that the pain is rather confined to the head of the bone, and that it depended on epiphysitis of the upper extremity of the femur in coxa vara. He mentioned a case of congenital luxation of the head of the femur on the ramus of pubis, where it was only decided, after careful examination, that it was not a case of coxa vara.

MR. LENTAIGNE questioned whether some of the cases of so-called morbus coxæ in early stages, which had been successfully operated on, were not merely cases of coxa vara.

MR. T. MYLES did not agree with Mr. Swan in saying that the condition of coxa vara was easily diagnosed from morbus coxæ, for it must be remembered that until the condition was described the mistake must have occurred a great many times. As yet the condition had not been accurately defined. He thought it extraordinarily like morbus coxæ in the early stage.

MR. CROLY said that he failed to see why coxa vara could not be diagnosed from morbus coxæ. What proof was there that cases which had been treated as morbus coxæ were really coxa vara? He did not believe that such had happened.

SIR W. THOMSON said that the condition had undoubtedly been

^a Muirhead Little. British Medical Journal. November 5th, 1898.

overlooked, and was different from morbus coxæ. He did not see why one could claim rickets as a cause when the condition is confined to the neck of the femur, and there is no evidence whatever in the rest of the skeleton of any rachitic condition. But he was satisfied that any condition in the neck of the femur which would lead to softening, whether inflammatory or pre-tubercular, is sufficient to allow straightening of the neck or the reduction of the angle. He agreed with Sir T. Stoker that the occupation of the patient had a great deal to do with the production of the condition.

SIR T. STOKER, in reply, said that the subject was a new one. and, of course, there was room for difference of opinion.

THE OPERATIVE TREATMENT OF HERNIA.

By J. S. M'ARDLE, F.R.C.S. ;
Surgeon to St. Vincent's Hospital, Dublin.

[Read in the Section of Surgery, December 9, 1898.]

MODERN METHODS.

It may be said that finality has been reached in this department of surgery ; a brief review, however, of the work that has been done during the last ten years will prove how very erroneous this view is. For my part, I believe that this subject is yet in its infancy, and, brilliant as has been the work of the past, the future will eclipse even its greatest successes. In the wide field of abdominal work there is no such display of uncertainty as to method of procedure as in relation to the treatment of ruptures. In our early days the hidden methods, so useless and at the time so fatal, were said to be perfect of their kind, and it is only with equal truth that similar statements are made with reference to the procedures of to-day.

I wish first to briefly refer to the more recent methods of carrying out the operation for hernia.

INGUINAL HERNIA.

Köcher's Method.—Our latest method for the radical cure (the displacement method—*Verlagerungsmethode*) of hernia, in which the sac is not too large or its wall too thick, is the following :—

An incision is made above and parallel to the inner two-thirds of Poupart's ligament. The characteristically-directed fibres of the aponeurosis of the external oblique are exposed, and the hernial sac is completely isolated. Now comes the *characteristic and essential step* of our method. A small open-

ing is made in the strong portion of the external oblique, above and external to the middle of Poupart's ligament (above and external to the region of the internal abdominal ring), and a special pair of curved dressing forceps is pushed through it—*i.e.*, through the aponeurosis of the external



Fig. 1.—Drawing the Hernial Sac through Inguinal Canal and External Oblique.

oblique and the muscular fibres of the internal oblique, and along the inguinal canal in front of the spermatic cord, to

emerge at the external ring, where they are made to seize the fundus of the isolated hernial sac (Fig. 1), which is drawn from below upwards and outwards along the canal, and through the small opening above mentioned.

Traction is now made upon the sac in an outward and somewhat upward direction away from the cord, and the funnel-shaped opening at the neck of the sac is drawn well into the small opening in the abdominal wall. The portion of the sac which is brought through the opening is now transfixed and stitched to the adjacent part of the abdominal wall (Fig. 2). The sac is now folded together and placed upon the *outer surface* of that part of the external oblique which forms the anterior wall of the inguinal canal, and is fixed to it by two or three sutures. The remainder of the sac is cut away. The sutures which fix the sac should take as deep a grip as possible of the upper and lower walls of the canal, and should therefore pass immediately over the spermatic cord, which is kept pulled downwards and protected by means of the finger introduced into the canal.

Ball's Operation consists in freeing the peritoneum on the inner aspect of the internal abdominal ring, and then the sac, after being isolated, is twisted into a tense cord, so as to throw the serous membrane into a series of folds, thereby producing a prominence internally rather than an infundibuliform depression. To prevent untwisting, a ligature is tied around it as high as possible, and it is also transfixed below the ligature by a thread, the ends of which are passed through the abdominal parietes.

Barker's Operation.—The neck of the sac is isolated, ligatured, and divided, the fundus being left *in situ*, whilst the thread used in tying the neck is employed as the first suture to close the deep part of the canal; by this means it is hoped that the neck of the sac will be displaced, and hence more satisfactorily occluded. It is very doubtful, however, whether this really occurs.

Macewen's Method consists in opening up the inguinal canal by dividing the aponeurosis of the external oblique, freeing the under surface of the abdominal parietes for some distance around the internal abdominal ring, and in placing

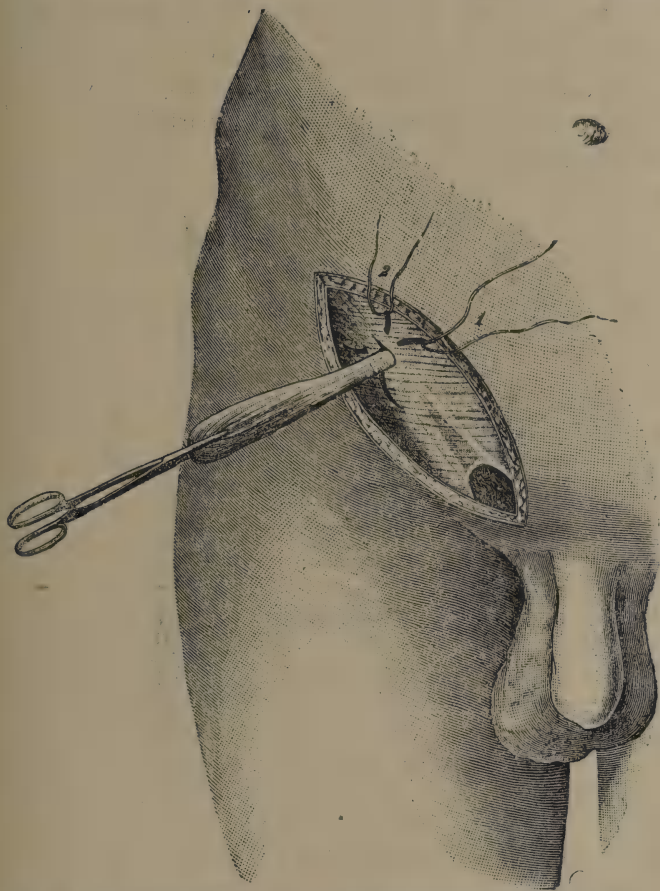


Fig. 2.—Fixing the Sac at point of Perforation of Oblique Tendon.

These Figs. show the second and third steps of Köcher's displacement method of dealing with the sac of inguinal hernia, and when combined with Macewen's suture of the conjoined tendon to Poupart's ligament under the external pillar of the abdominal ring, a thoroughly secure closure of the inguinal canal is brought about.

therein, as a pad across the internal opening of the canal, the sac which has been previously isolated and threaded through the silk in such a way as to throw it into folds. The silk thread is then passed by means of a needle through the abdominal parietes on either side, and fixed by traversing the aponeurosis of the external oblique once or twice. The canal is subsequently closed with sutures (Fig. 3), which are passed in such a way as to draw up Poupart's ligament over the arched fibres of the internal oblique.



Fig. 3.

In *Bassini's Operation* the external oblique aponeurosis is divided, so as to expose the lower arched fibres of the internal oblique. The sac is ligatured and removed, as also any varicose spermatic veins, and the structures of the cord displaced and drawn forwards and outwards

through the wound in the external oblique. The canal is completely closed behind the cord by a row of sutures, securing the lower arched fibres of the internal oblique to the under surface of Poupart's ligament. The cord is then replaced, and the divided fibres of the external oblique are sutured over it.

Halsted's Operation is much the same, except that the fibres of the internal oblique are also divided at the outer margin of the internal ring, and the cord displaced upwards and outwards through this opening, so that at the spot at which it pierces the abdominal parietes it may be surrounded by muscular fibres. The canal is then closed as in the former operation, whilst the external oblique is also sutured behind the cord, which is thus made a subcutaneous structure.

Method of Banks.—The sac having been made certain of is separated from the cord, and detached through the external ring up in the canal as high as the internal ring, the finger keeping note all the time of the position of the cord. If the sac is clearly empty, its neck is now ligatured with stout chromic gut or carbolised silk as high up as to leave no neck, orifice or dimple at the internal ring. The fundus is then cut away about half an inch below the ligature. As to sutures of the ring and canals, it would appear from his latest paper that Mr. Banks is now satisfied with suturing the external ring. "In inguinal hernia, in addition to this." (dissecting out and removing the sac as high up as possible) "the pillars of the external ring have been pulled together by two or three silver wire sutures, which are left in position after their ends have been cut very short."

Method of Bennett.—The sac is exposed and carefully isolated from its connections just below the external ring (the lower part being left entirely undisturbed); it is then opened, and the contents reduced into the abdomen, if they

have not already returned spontaneously. The sac is now divided just below the external ring, the distal portion being allowed, after all bleeding has been stopped, to drop back into the scrotum. The proximal part of the sac is next separated from the sides of the canal as high up as the internal ring by gentle manipulation. One finger (or more if the ring is large) of the left hand having been introduced into the abdominal cavity through the neck of the sac, any bowel lying near the internal ring is pressed back out of the way. An ordinary pile-needle on a handle (unthreaded) is then made to enter the abdominal aponeuroses about three-quarters of an inch above the upper margin of the external ring, a little to the outer side of its middle line, and transfixes the whole of aponeuroses and peritoneum, impinging on the end of the finger which occupies the neck of the sac. The needle, guided by the finger, is passed down the inside of the sac, and made to pierce its outer wall at a point about half an inch from the cut edge. The needle having been threaded with a tendon or catgut suture, previously prepared, and not less than twelve inches long, is withdrawn, taking one end of the suture with it. The result is that one end of the suture is seen passing into the abdominal aponeuroses above the external ring, while the other issues from the outer wall of the proximal part of the sac, near its cut edge. The needle, again unthreaded, is now made to transfix the abdominal aponeuroses and peritoneum about half an inch internal to the point at which it entered before, traversing the sac in the same way, finally piercing the inner wall at about the same distance from the cut edge as it had done on the outer side. After having been threaded with the lower end of the suture the needle is withdrawn, carrying the suture, as before, with it. The two ends of the suture will now be seen entering the aponeuroses above the external ring, and forming below a loop over the cut edge

of the proximal portion of the sac. The open end of the sac is next sewn up by a continuous stitch of catgut or silk, or occluded by a silk ligature placed around it as close as possible to the spot at which the invagination suture pierces its sides. The succeeding step is the invagination of the sac, which is effected by pushing with the finger the closed end through the canal into the abdomen, the invagination suture passing through the aponeuroses being at the same time drawn tight. By this proceeding the sac is turned completely outside in, and its fundus firmly attached to the peritoneal surface of the anterior abdominal wall some distance above the internal ring."

Stanmore Bishop's Method.—This is a modification of Prof. Macewen's. The sac having been freed entirely up to, but not beyond, the internal ring, is carefully emptied, and kept so by the finger of an assistant pressing upon the ring. By means of a long, strong catgut suture, which is passed through each side of the sac, this is hemmed round, and thrown into a number of folds. The neck of the sac is then invaginated, and each end of the suture carried by a needle through the canal, and through the pillar of the internal ring nearest to it, from within outwards. When both ends are presenting through the muscular structures they are pulled up, the sac being at the same time invaginated before the finger as the threads are drawn upon. The sac is then drawn inside-out in its passage, and becomes fixed as a rounded boss exactly over the inner ring, its peritoneal surface being turned towards the intestines, and its first fold on either side being firmly applied to the peritoneum immediately within the ring. The ends of the suture are then tied firmly, but not tightly, over the ring; finally this and the canal are sutured.

M'Burney's Method.—This is different from all others described, in that, instead of trying for primary union, the wound is made to heal by granulation tissue.

The sac having been reached by an incision exposing the whole canal and external ring is separated and tied as high up as possible. The part below the ligature is then cut away. In order to keep the wound an open one the superficial are then stitched to the deep parts; next skin and conjoined tendon above; below, skin and Poupart's ligament are sutured together. The wound is then packed with iodoform gauze. The wound is thus made to fill up by granulation tissue, producing a thick scar, which M'Burney believes to be the best guard against relapse.

Cheyne's Operation.—"The operation as I have described it is in its essence Bassini's, but it is not carried out exactly as he describes, in fact it is a combination of various operations. Thus the method of cutting off and tucking up the sac and the use of the silk is borrowed from Barker; the principle of bringing the internal oblique to Poupart's ligament behind the cord is Bassini's, but the mode in which the stitches are applied is borrowed from Macewen; the use of silkworm-gut for the incision in the external oblique is from Stanley Boyd; the boot-lace suture I used myself, but I find that Boyd has also used it" (Cheyne).

A word now in reference to these procedures.

Let us first take the displacement method so vigorously advocated and so generally carried out, and we find that the latest outcome of the genius of Köcher has within itself the germs of failure, and that it requires but time to dispel the illusion as to its perfection. The great name of Köcher has secured for this procedure a position which, as an operation, it would in other circumstances have no chance of attaining. Easy of application, perfect in its immediate result, it seemed to be the acme of perfection, but when we come to study the details of the procedure closely we discover a weakness which is certain to lead to the abandonment of this method, at least in part. The principle on which operations on

herniæ should be carried out is the proper reconstruction of the canals through which they travel. In Köcher's method an effectual bar is put to any such effort being made—first, by the want of free opening of the inguinal canal; and, second, by the interposition of the hernial sac between its walls. I fail to see the grounds for the substitution of this procedure for methods already extensively and very successfully carried out. The only part of Köcher's operation which I now carry out is the displacement of the sac. I object to the other steps, because, first, the suture at the internal ring is made in the dark, and any blind procedure of this kind is unsound in principle; second, the suture of the canal itself includes the external oblique tendon, and must, therefore, be faulty, as it causes the intervention of a very avascular tissue between the internal oblique and the deep aspect of Poupart's ligament.

Ball, Bennett, and Bishop in their procedures fail to recognise the one essential of a sound operation for hernia—viz., accurate closure of the inguinal canal. Devoting all their energy to the minor detail of dealing with the sac, they seem to forget that the elasticity and the capacity for sliding possessed by the peritoneum allows it to accommodate itself to any inequalities of the middle stratum of the abdominal wall, and to find out any point of weakness therein under pressure of the abdominal contents. Banks, too, depends on closure of the abdominal end of the sac, and makes no attempt at restoration of the mid-stratum of the abdomen. Notwithstanding the over-much laudation we hear of the method of Halsted, a modification of that of Bassini, I have a strong objection to it. Interfering with the course Nature originally arranged for the passage of the spermatic vessels and duct does not seem the correct way to start. My faith lies rather in the opposite course—that is, to bring the structures as nearly as possible to the line in which we find them

in normal man; besides it is a matter of notoriety that the part of the inguinal canal over the pubes is not closed completely, even after making a secondary opening for the passage of the cord. Thus we have two openings instead of one, and until we have statistics reliable enough to convince us that recurrence is not more frequent after this method than after the methods we have carried out for the past 16 years; I for one shall persistently refuse to carry out this plan, unless as a demonstration for my class in the school of operative surgery. Another point I wish to accentuate is that after this operation, if there be any yielding of the abdominal wall, and truss support becomes necessary, the abnormal position of the cord prevents its use.

A word as to the statistics of these operations. I was called suddenly one morning recently to a gentleman, sixty-five years of age, who for many years had an irreducible left inguinal hernia, which he carefully preserved in a leathern purse. For some days before my visit he suffered from constipation, which had not yet been relieved; vomiting had set in during the night and was now stercoraceous. I told this gentleman that operation alone could save him. "Then I'm done for," was his reply. His opinion did not weigh with me, so I continued in silence trying to determine exactly the operation I felt certain I would be compelled to carry out immediately. Before long the reason for my patient's fear was explained. For thirty years his successive medical advisers had informed him that his heart was very bad, and that the mortality from hernial operations, even in those with good hearts, was sixty per cent. He reasoned, then, that his was a very poor chance indeed. The reasoning was sound, but where did the statistical premise come from? This gentleman went on the table full of the notion that his heart was unequal to the task I desired to impose on it, and I fear my eloquence availed little in dispelling statistical

error. My scalpel has done more than my logic to for ever dispel the illusion as to his heart, and he believes with me that his advisers were only guessing at the mortality of hernia operations. You can make statistics prove anything, *provided you are easily convinced that everything is as it appears*; and after reading the reports of the different operations it is refreshing to turn to such an impartial work as that of *Keen and G. White* to find that operators of distinction are free to confess that they cannot ascertain with certainty a success of more than fifty per cent. in the radical cure of hernia.

That hernia occasionally returns, however carefully the operation is carried out, is easy to prove, but to secure that all cases which recur return to the first operator is impossible: this is why the statistics are unreliable. The statistics of mortality, however, are very different. The patient is under observation long enough to show what influence operation has for life or death, and so we can decide this question off-hand when we have enough material to go on. For myself, I have long since decided that, given a patient otherwise in good health, there is no justification for any mortality, and we should be careful that our medical brethren do not quote the statistics of the anti-Listerian era, or the results of those who still elect to live in that period, as regards operative procedures.

I append a table of the cases operated on by me for the past sixteen years. Of the 342 cases operated on it will be seen that there was only one death, and that in a case of umbilical hernia in a very stout old man with a weak heart and atheromatous arteries, and at the time of operation suffering from a sharp attack of bronchitis. He died of broncho-pneumonia on the fifteenth day after operation.

The only case coming to me for operation on account of a return of the hernia was a man from Glasgow on whom I

HERNIA—Three Hundred and Forty-two Cases of Radical Cure.

	INGUINAL—273		FEMORAL—41		UMBILICAL—26	
	Males—255	Females—20	Females—37	Males—4	Females—19	Males—7
Intestine	186—31 congenital	11	10	1	5	1
Intestine and Omentum	44—Omentum resected in 35	5	13	1	4	2
Omentum	6	—	11	—	10	4
Appendix	16	None	None	—	—	—
Bladder	3	1	None	1	—	—
Ovary	—	1	2	—	—	—
Tumour	—	2	1	1	—	—

had operated eight years before. A great weight had fallen on his abdomen some weeks before his return to me, and, as he thought, reproduced the rupture. On examination I found a hernia on the right, the side of the first operation, but it was femoral, not inguinal as the first had been. In performing the radical cure I extended my incision well over the line of the former operation, and found dense scar tissue all along the canal, the overlapping pillars of the external ring being firmly united.

The mortality statistics of my cases I can vouch; would that I could be as positive as to such complete success in the matter of radical cure. I have no doubt that in many of my cases recurrence has taken place, and that my surgical *confrères* here and elsewhere have extended a helping hand to me, as I willingly do to them when occasion demands the effort. We should not, however, in estimating the value of this operation be guided solely by the number of recurrences. The condition after recurrence as compared with the condition prior to operation should also be taken into account. Judged in this way the radical cure of hernia holds one of the highest positions in modern scientific surgery.

CONCLUSIONS.

1. Without opening up the inguinal canal no complete operation can be performed.
2. It is a matter of little importance what you do with the hernial sac; it has no bearing on the case, as long as you dispose of it so as to leave the inner surface of the abdominal wall perfectly smooth, since that condition is characteristic of it in the healthy subject. A new sac forms with the greatest readiness, if at any point the mid-stratum of the abdominal wall is defective.
3. There is no evidence in favour of opposing the arrangements of Nature by displacing the cord, as in Bassini's method.

4. To properly reconstruct the canal, the internal oblique and conjoined tendon should be brought down to Poupart's ligament, not merely to the edge of the external oblique.

5. The complete overlapping of the pillars of the external ring forms a firm basis of support for the healing of the underlying conjoined tendon.

INGUINAL.

The method of operation which I now carry out is shown in the accompanying figures. It consists in drawing the sac upwards and outwards through the external oblique, and fixing it near the anterior superior spine, after Köcher's

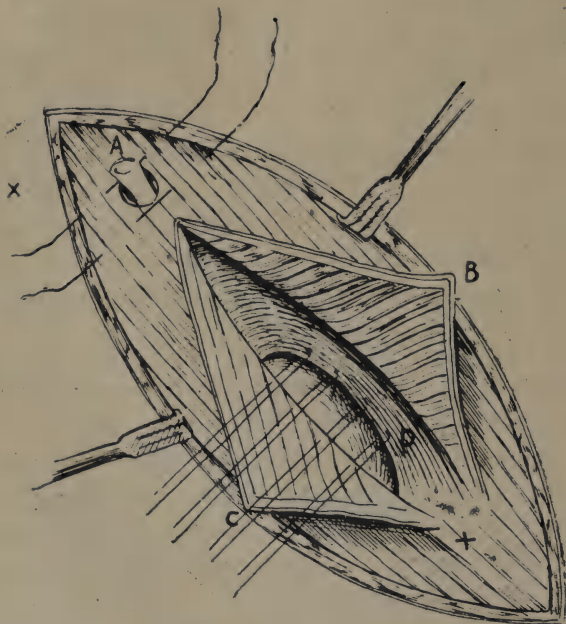


Fig. 4.

- A. Sac drawn through external oblique.
- B. Inner pillar of ring.
- C. Outer pillar of ring.
- D. Conjoined tendon

method (Fig. 2); then with interrupted sutures bringing the conjoined tendon down to inner edge of Poupart's ligament, so as to close inguinal canal, except at its lower part (Fig. 4). Now the outer flap of the external oblique is drawn upwards

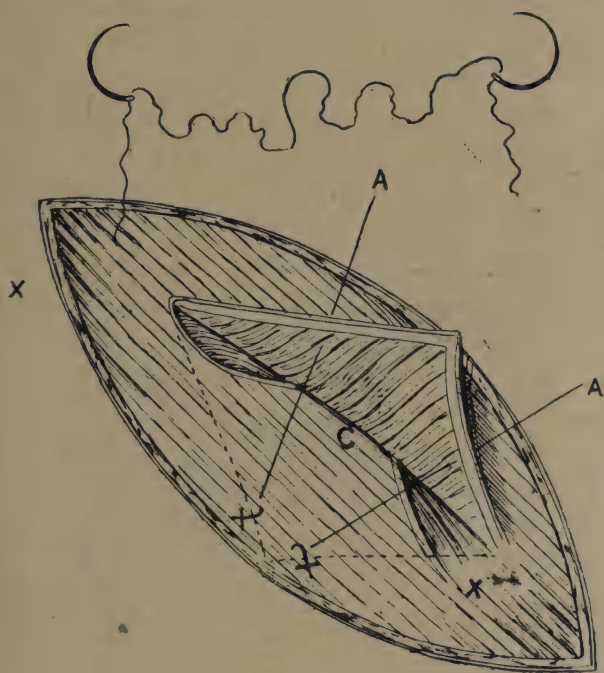


Fig. 5.

A A. Suture passed with needles, as in figure, drawing outer pillar under inner pillar.

under the inner flap and fixed by suture, as in Fig. 5. The inner flap is now brought downwards and outwards and fixed to the deep fascia of the thigh below Poupart's ligament. A few silkworm-gut sutures in the skin complete the procedure.

FEMORAL.

The incision should be a semilunar one, beginning above the middle of Poupart's ligament, convex downwards, and ending a finger's breadth above the spine of the pubes; when the flap thus formed is turned up, as in

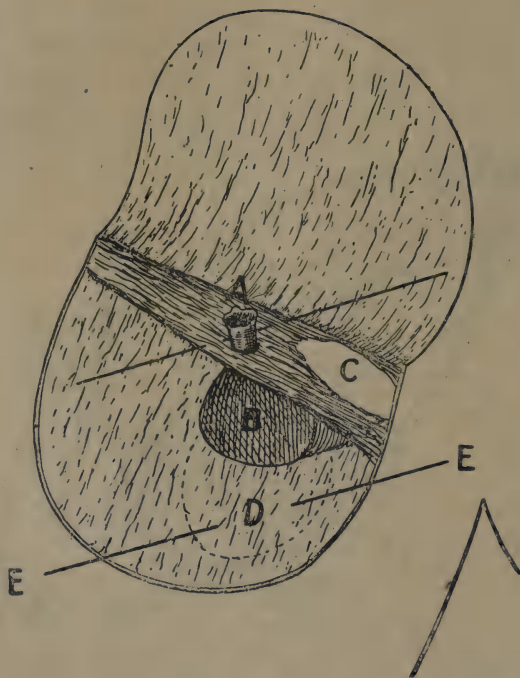


Fig. 6.

- A. Sac drawn through above Poupart's ligament.
- B. Neck of sac as first closing of femoral ring.
- C. External abdominal ring.
- D. Flap of pectineus destined to form second closing of femoral ring.
- E. Sutures to bring flap D into position.

Fig. 1, the femoral ring and canal are fully exposed, and plenty of room is obtained for necessary manipulations. The sac of the hernia is cut transversely an inch to an inch

and a half below Poupart's ligament, and, after complete reduction of the bowel or omentum, a long-bladed clip forceps is pushed through the external oblique from without inwards, and made to come through the femoral ring in front of the sac, the mouth of which it now grasps. Traction on

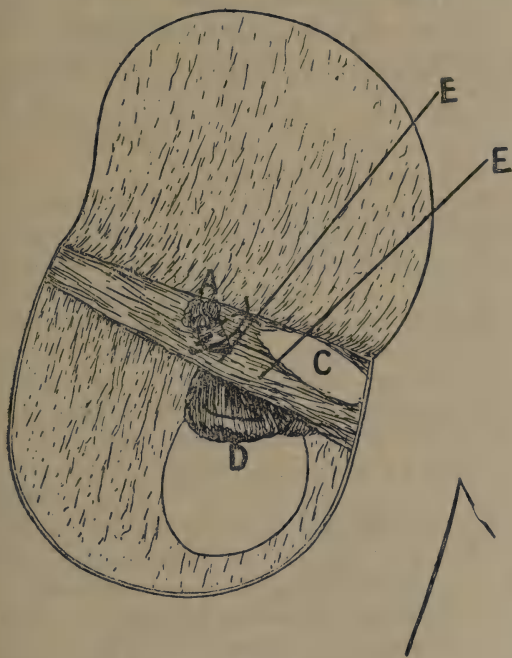


Fig. 7.

- A. Sac fixed by suture.
- B. Covered up by flap D.
- C. External abdominal ring.
- D. Piece of pectineus and pectineal fascia closing femoral ring.
- E E. Suture passed above Poupart's ligament holding pectineal flap in position.

this brings it through the oblique muscle, as at A, Fig. 6, where it is fixed as shown. Now a suture, with a fully-curved needle at both ends, is passed deeply through the pectineus muscle, as at E E, Fig. 6. The needles are now passed through the femoral canal, and made to pierce the

external oblique, as at E E, Fig. 7, no traction being made on the thread for the present. At this stage all bleeding points should be secured by ligature, and all forceps removed. Next, the pectineus muscle should be cut through, as shown by dotted line in Fig. 6. and flap D drawn well inside the femoral ring to thoroughly block that opening, as shown in Fig. 7. Replacement of the semilunar flap completes the procedure, silkworm-gut or silver wire being used to fix it in position.

MR. CROLY believed that closure of the internal ring is the most important part of the operation for the radical cure of hernia. Slitting up the inguinal canal and suturing it without closing the internal ring is not sufficient, and would be followed by return of the hernia. He himself liked the displacement method of Köcher best, and his experience of that operation was that the method was excellent. After cutting down on the canal it was impossible to separate the sac and draw it up from the bottom of the scrotum by Köcher's method. His practice was to cut across the sac, displace the open mouth upwards and outwards, ligate it, and suture it outside the internal abdominal ring, and dissect the sac away from the scrotum. He looked upon the twisting operation as a very dangerous one. How was one to know what he was twisting? A piece of intestine or bladder might easily be nipped in. He said that he had seen two cases in London hospitals where, after the twisting operation, urine came out through the groin. Köcher had given up twisting, as it caused necrosis of the sac. He had only had two cases of death after the operation of radical cure.

MR. T. MYLES said that it had to be decided which of two fundamental principles one proposed to adopt in performing the radical cure of hernia—whether it was intended to rely merely on reposition of the sac and super-imposition of an obstacle at the commencement of the inguinal canal, or whether it was intended to ignore the sac and rely on an attempt to restore a condition analogous to that of healthy persons. He believed that every case of acquired hernia has a congenital basis as its origin. The force which prevents the descent of a hernia, by the exercise of that

same force occludes the channel through which the hernia would descend—in other words, the canal is valvular. The greater the pressure within the abdominal cavity in a properly formed individual the more forcibly will the posterior wall be applied to the anterior wall of the canal. In every case of hernia the distance between the external and internal rings is diminished. The internal ring, in case of hernia, is always larger than normal owing to defect of development of the conjoined tendon. If this theory is correct, then any attempt to prevent descent of hernia by manipulation of the sac would end in failure. He failed to see exactly what Mr. Croly and Mr. Ball, in a recent article, meant by closure of the intestinal ring and the approximation of the superficial and deep structures of the canal. The internal ring, as it existed in cases of inguinal hernia, really had only one border—viz., the edge of the conjoined tendon. So far as the mere dealing with the sac is concerned, he condemned Mr. Ball's method. Twisting of the sac in Mr. Ball's method produced a vortex and a smooth lining membrane over it. He thought that necrosis of the sac could only occur when an enormous redundant mass of tissue is left below. In the first place, a tissue is left which is bound to die; and in the second place, a hindrance to the second step of the operation is left. He agreed with Mr. M'Ardle in the first part of his operation, except that he did not make the incision so long. He did not like Halsted's operation. His own opinion was that a radical cure could be made in a man who has an approximation to a normal inguinal canal.

MR. BALL said that he agreed with Mr. M'Ardle in endeavouring to obtain a smooth surface of peritoneum at the level opposite the internal ring; but he believed that this could not be obtained by any method in which a ligature is applied to the neck of the sac, no matter how high up it is put, and there will be always left a depression above the ligature through which a subsequent hernial sac can be produced. One should aim at the obliteration of any depression at the point where the neck of the sac originated from the peritoneum, and also at the efficient closure of the inguinal canal. There were many difficulties in the way. He thought it improbable that any suture which brings the anterior pillars of the ring together will cause any union between them. But the fascia derived from the fascia transversalis, which comes down, as a rule, on the hernial sac, is a vital structure, and any operation dealing with a hernial sac must tear the sac away from

this tube of fascia, and suturing of the inguinal canal must occlude this long canal of fascia. He was now in the habit of doing a slight modification of his operation as originally published, which was suggested to him by Köcher's operation. After bringing down the sac, and twisting it till the sac and neck were sufficiently twisted to occlude the whole length, and to throw into folds the peritoneum surrounding the inguinal canal, a silk suture is passed up through the inguinal canal and brought out through the entire thickness of the abdominal wall, and out through the skin. The needle is threaded on the other end of the silk, and is passed up, and brought out through the skin at a point on the same level about an inch above the apex of the external abdominal ring. On dealing with that loop, what might be called the "bite" of the stump is caught, which is pulled up in the subperitoneal tissue at the back of all the abdominal muscles, and is fixed at a certain point by tying the suture over a little lead button, where it can remain for eight or ten days. If the fundus is of moderate size it will lie in the apex of the abdominal ring. In the further steps of the operation the fundus of the sac, together with the spermatic cord, is pressed backwards round the edge of the conjoined tendon towards the peritoneal cavity, and a curved needle, threaded with silk, is passed through all the lateral structures of the inguinal canal. By his method the sac was directed upwards to the point where it is fixed, and if that tends to dilate, it tends to dilate against the strong muscular abdominal wall, instead of against the weak inguinal canal.

MR. TOBIN spoke very highly of Mr. M'Ardle's method, which was, perhaps, longer in existence than any other method. The first question to be considered, he thought, was, what is the kind of force which extends the abdomen? When the abdomen is distended there is an even stretch on all the engaged parts. One ought to try to get a new union and smooth closure for the opening in the radical cure of hernia, and attempt to bring back the parts to a condition in which, if forces were applied, there would be no spot on which there would be a particular drag. He thought that a more even surface could be obtained by applying a ligature round the sac than by Mr. Ball's method.

DR. KNOTT said that he would like to add his testimony to Mr. M'Ardle for his brilliant results.

MR. M'ARDLE, in reply, said that he still believed the only way to cure hernia was to close the middle stratum of the abdominal

wall. It was necessary to secure the neck of the hernial sac by all means, but that was not the one desideratum. Mr. Croly, he thought, had been mistaking the neck of the sac for the internal abdominal ring. Ligature will not secure the ring, because there is nothing to ligature. It was to make the valvular condition of the wall more perfect that he carried out his operation. He emphasised the fact that not alone did the structures which he had mentioned join, but that the external pillar united to the internal pillar. This he had proved by subsequent dissection for other things. Regarding the question of the fascia transversalis, in any operation the needle used to bring the conjoined tendon, the transversalis, and the internal oblique take in the transversalis fascia, and also the subperitoneal fatty tissue. The similarity of Mr. Ball's method to Cheyne's was very marked as described by himself. The question of the bladder is very important. The bladder might be pulled up without any peritoneum behind it, so that the muscular tissue of the bladder comes out behind the sac. It could not be detached, for if this were done it would be detached from its peritoneal covering above.

DISLOCATIONS AND FRACTURES OF THE ASTRAGALUS.

By HENRY GRAY CROLY, F.R.C.S. ;

Ex-President, Royal College of Surgeons ;
Senior Surgeon City of Dublin Hospital.

[Read in the Section of Surgery, January 20, 1899.]

IN the list of surgical accidents none are more serious in character and consequences than the cases I have the honour of bringing under the notice of the Surgical Section of the Royal Academy of Medicine this evening. In 1891, when I occupied the chair as President of the College, I read a paper on Compound Luxations of the Ankle-joint, illustrated by cases, with special reference to the preservative surgery of the foot, and in that communication I ventured to introduce the subject with a few practical remarks on the surgical anatomy of the joint. I see no reason to deviate from that course in this communication.

The astragalus, also called *os balistæ* and *talus*, is situated between the tibia and *os calcis* and navicular bone in front, in size ranks second among the tarsal bones, and is divided into three parts—body, neck, and head. Five surfaces are observed on the body. The superior surface, of an oblong, quadrilateral shape, forms an articular trochlea, convex from before backwards and slightly concave transversely (the reverse to the form of the end of the tibia); it articulates with the inferior extremity of the tibia, and measures $1\frac{1}{2}$ inches antero-posteriorly and about $1\frac{1}{4}$ transversely—the latter measurement is greater in front than behind—a beautiful provision against luxations backwards of the foot. The posterior surface is occupied by a well-marked groove which passes obliquely downwards and inwards, and lodges the tendon of the flexor pollicis longus,

which acts as a ligament, and prevents luxation backwards of the astragalus. The external surface is occupied by a triangular facet which articulates with the fibula. The internal surface is articular, for adaptation of the inner malleolus. The inferior, or under surface, is occupied by a concave articular facet, oval, with its long axis directed from within outwards and forwards. This facet articulates with a corresponding one on the os calcis; immediately in front of it there is a deep and narrow depression, trumpet-shaped, which separates it from an oval planiform facet for articulation with the sustentaculum of the os calcis. The head is smooth and oval, and is adapted to the concavity of the navicular bone. The aspect of the head is forwards, inwards, and slightly downwards. On the inferior part of the head there is another facet, planiform and continuous with the surface described. By means of this facet the astragalus moves on the upper and anterior part of the os calcis. The neck is rough and perforated by blood vessels.

The astragalus is firmly secured in position by ligaments. The mortise cavity formed by the lower end of the tibia is completed by the fibula. The powerful ligamentous connection between the tibia and fibula makes the mortise very strong. The tibia and fibula form together a cavity which receives the pulley-like surface of astragalus, and thus presents one of the purest hinge-joints in the body. The external malleolus projecting lower and more posteriorly than the internal, gives considerable strength by "wedging" the astragalus.

In flexion of the foot the astragalus rolls from before backwards in the tibio-tarsal mortise, the anterior tibio-tarsal and fibulo-tarsal ligaments are relaxed, the posterior and middle fibulo-tarsal are rendered tense, the internal tibio-tarsal ligament has its posterior fibres stretched, and its anterior ones loosened.

During extension the astragalus rotates forwards in the tibio-fibular mortise, the posterior ligaments are relaxed and the anterior are put upon the stretch. In the upright position the fibula plays no part in the function performed by the joint. The tibia alone receives the weight of the body, and transmits it to the astragalus. The astragalus has been compared to the key-stone of an arch, the arch being represented by the foot. The true design of the vaulted form of the foot, however, is to permit its accommodating itself to the several irregularities of surface, which both in standing and progression it must encounter. Notwithstanding the perfect construction of the ankle-joint and its powerful ligaments, violent accidents set all these precautions at defiance, and produce the most painful and formidable displacements.

The greatest extent of the superficies of the astragalus is covered with smooth cartilage, by which it is rendered much more movable than any other tarsal bone, and therefore more liable to dislocation.

The momentum of the body being impinged with great force upon the astragalus, as in jumping from a height, or by a severe fall, the direction in which the astragalus is sent off the os calcis depends on the position of the foot at the time the astragalus receives the whole momentum of the body. The position of the foot also determines the direction in which the force acts upon the astragalus. If the foot be extended the dislocation will be forwards; if extended and twisted outwards it will be forwards and inwards; if extended and inwards it will be outwards; if twisted outwards it will be inwards; if bent (flexed) it will be backwards; and if bent and twisted outwards it will be backwards and inwards. A thorough knowledge of practical anatomy, to be learned only in the dissecting-room, and combined with a good hospital experience, will enable the practitioner to

diagnose, even when swelling has set in, these most serious cases. The excuse, always ready by those ignorant of anatomy and surgery—viz., “I cannot diagnose until the swelling or inflammation subsides”—brings discredit every day, and is the cause of unnecessarily prolonged suffering, even to the risk of limb or life itself.

Although severe falls or wrenches of the foot have caused the greater number of the recorded cases, occasionally, as in Mr. K.’s case, communicated by me this evening, the simple slipping off the edge of the footpath (a few inches in height), and turning the foot inwards, caused a complete luxation forwards and outwards of the astragalus, with rotation of the superior articular surface.

Dislocations of the astragalus may be complete or incomplete, simple or compound, the bone being displaced forwards and outwards, forwards and inwards, directly forwards or directly backwards. There may be rotation, partial or complete, on its antero-posterior axis; the bone may be thrown transversely or upside down. A large number of such luxations are compound.

Turner, of Manchester, tabulated a very able and exhaustive history of cases of astragalus dislocations, collected from published works.

Sir Astley Cooper, Dupuytren, Fergusson, Williams, Tufnell (Dublin), Broca, Boyer, Malgaigne, Lister, Lizars, Guthrie, Desault, Nélaton, Hancock, Hutton (Dublin), Hey and Smith, of Leeds, Abraham Colles, Cline, Syme, John M. Donnell, Letenneur, Phillips, Cron, Campbell de Morgan, Lee, Lonsdale, Pollock, and many others, contributed cases of these luxations.

Fergusson says, “dislocation of the astragalus in any direction, and under any circumstances, must be looked upon as a very serious injury; for, although many instances have been seen where life and limb have been preserved, even under

great disadvantages, it must be admitted that such satisfactory results have not always followed the praiseworthy attempts of the surgeon to avoid amputation."

The first case of dislocation of the astragalus which came under my notice occurred when I was Purser-student, residing in the City of Dublin Hospital.

CASE I.—A middle-aged man was working on a scaffold at the building of a house in Lower Baggot-street. He fell from a considerable height and landed on his left foot on a brick, turning his foot inwards. He was conveyed to the hospital at once, and Mr. Williams, one of the surgeons and ex-President of this College, who was on accident duty, was promptly in attendance; Mr. Tufnell also came. On examination the foot was inverted, resembling talipes varus, and the head of the astragalus formed a projection on the anterior and outer aspect of the foot. A clove hitch was placed on the foot, the leg was flexed on the thigh and the thigh on the pelvis; extension was made, and Mr. Williams grasped the heel in his fingers and made steady pressure with his thumbs on the head of the astragalus and the bone returned quickly to its normal position. The patient made a good recovery and had a very useful foot. That case made an everlasting impression on me, and when teaching anatomy and surgery, in the school attached to this College, I never lost an opportunity of teaching my pupils the astragalus injuries.

The following cases of fracture and dislocation of the astragalus occurred in my hospital and private practice:—

COMPOUND FRACTURE OF LEFT ASTRAGALUS.

CASE II.—A groom, aged twenty-five, was admitted into the City of Dublin Hospital, under my care, suffering from the effects of a severe injury to his ankle-joint.

History.—He was riding through one of the streets, the horse slipped and fell on his side, the man's foot was caught in the stirrup, which was bent by the weight of the horse's body. The young man was admitted into a surgical hospital and his foot was placed in a box splint. He suffered much pain for a couple of months and left the hospital, as he refused to submit to amputation of his foot. On admission to the City of Dublin



PLATE I.

M. R.'s foot at the time of the accident. From original drawing by
Miss Croly.

Hospital I observed an opening at the inner side of the ankle-joint, through which unhealthy and foetid pus escaped. A probe quickly detected dead bone. Assisted by Mr. Tufnell I opened the joint and removed a fractured, loose astragalus. The joint was drained and the patient made a good recovery and left the hospital walking on the injured foot.

COMPOUND LUXATION OF THE LEFT ASTRAGALUS FORWARDS AND OUTWARDS; EXCISION OF THE BONE; RECOVERY WITH PERFECT USE OF THE FOOT.

CASE III.—M. R., aged twenty-six, was driving a horse in a high trap across Butt Bridge; the back band broke, the shafts fell down, and the man jumped to save himself, and he landed on his left heel; he suffered intense pain. Dr. Fitzgibbon, who was passing at the time, examined the man's foot and observed the head and neck of the left astragalus projecting forwards and outwards through a wound. He sent the man at once to the hospital, and I saw him shortly after his admission.

Appearance of injured foot.—Marked inversion, head and portion of the neck of the astragalus projecting through a small wound on the anterior and external aspects of the foot, *internal malleolus completely buried, deep sulcus taking its place.* I decided to excise the bone, as it was evidently separated from all its ligamentous connections and its vascular supply cut off. Patient having been anæsthetised I made an incision over the displaced bone and removed it without difficulty. On examination a detached fractured portion was found involving the groove of the flexor longus pollicis. A good deal of inflammatory action followed this very serious foot lesion and abscesses formed. The patient made an excellent recovery, and is now employed as a van-driver and the foot is as sound as if no accident occurred. There is considerable movement in the joint. This is the astragalus, and this cast [exhibited] was taken before the patient left hospital.

Measurement of legs :—

Injured leg—Inside of patella to ball of great toe, $18\frac{1}{2}$ in.; sound leg, do., $19\frac{1}{2}$ in. Injured leg—Inside of patella to point heel, $17\frac{1}{2}$ in.; sound leg, do., 18 in. Injured leg—From point of heel to ball of great toe, 6 in.; sound leg, do., 6 in.

COMPLETE DISLOCATION OF THE RIGHT ASTRAGALUS FORWARDS AND OUTWARDS, WITH ROTATION OF BONE; EXCISION OF ASTRAGALUS; PERFECT RECOVERY WITH VERY USEFUL FOOT; GOOD FLEXION AND EXTENSION AT JOINT.

CASE IV.—Mr. K., aged sixty-nine years, a very healthy and robust man, was walking down one of the principal streets about 3 p.m. on 18th Dec., 1897; his foot slipped off the kerbstone, twisting the foot inwards; he suffered severe pain and fell. He was admitted into a hospital and was attended by surgeons for eleven days; his leg, foot, and thigh were placed in a box splint and Roentgen rays were employed.

I was summoned to see this gentleman on the 31st December. He was removed to his residence in an ambulance, as the box splint was too large to admit of being received into a cab. I found the patient in a most serious state; pulse rapid, breathing oppressed, great nervous prostration. He said he had scarcely any sleep from the time of his admission to hospital, and suffered intense agony. I removed the bandages and large box, and on exposing the right foot I at once recognised the case as one of complete luxation of the astragalus forwards and outwards. The foot was forcibly inverted; *the internal malleolus was completely buried (a deep sulcus occupied its place)*; the head of the astragalus formed a prominent tumour on the anterior and external part of the dorsum; the skin over the head of the astragalus was red and shiny; a large slough formed over the end of the fibula; another large slough existed between the deep groove on the inner side and the os calcis; bullæ formed on the foot also; at each side of the knee the skin was broken, due to splint pressure. The patient experienced immediate relief when all splint and bandage pressure were removed; boric stupes were applied to the joint; suitable diet and hypnotics were prescribed, the septic bronchitis was attended to; water cushions were placed under the hips, and the affected limb was placed and retained on a properly protected pillow. For nearly two months this gentleman's life was in the balance. His naturally good constitution and very temperate habits gave hope that his life and limb, with great care, might be preserved. Bullæ and abscesses were opened, sloughs became detached; bronchial irritation subsided, and on the 5th of March (about two months subsequent to the patient's return home) I operated. The drawing I exhibit was taken by my friend and former surgical resident, Paul Carton, M.B., B.Ch., and shows



PLATE II.

Showing M. R.'s foot six months after excision of astragalus. Bone shown also.

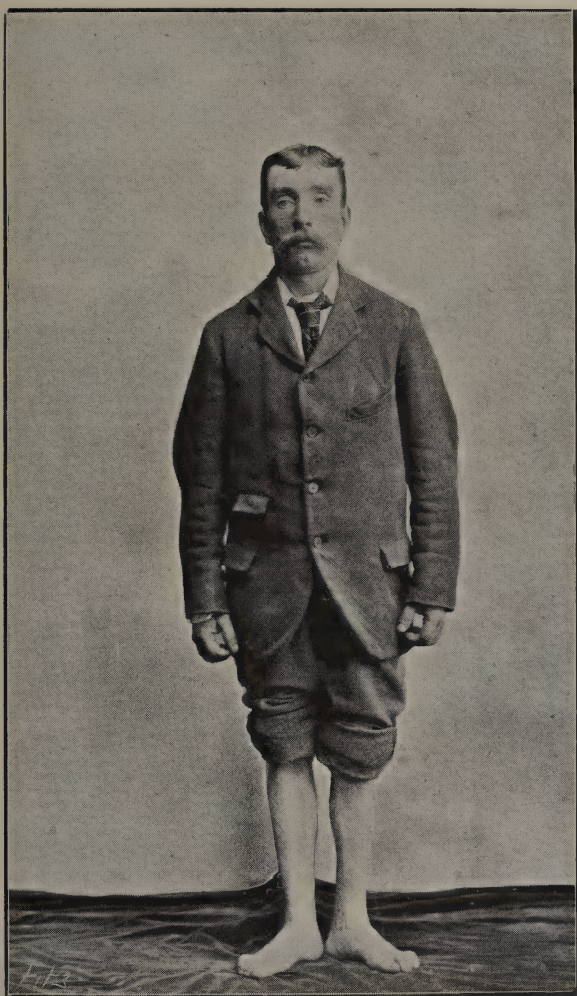


PLATE III.

M. R. two years after accident. From photo.

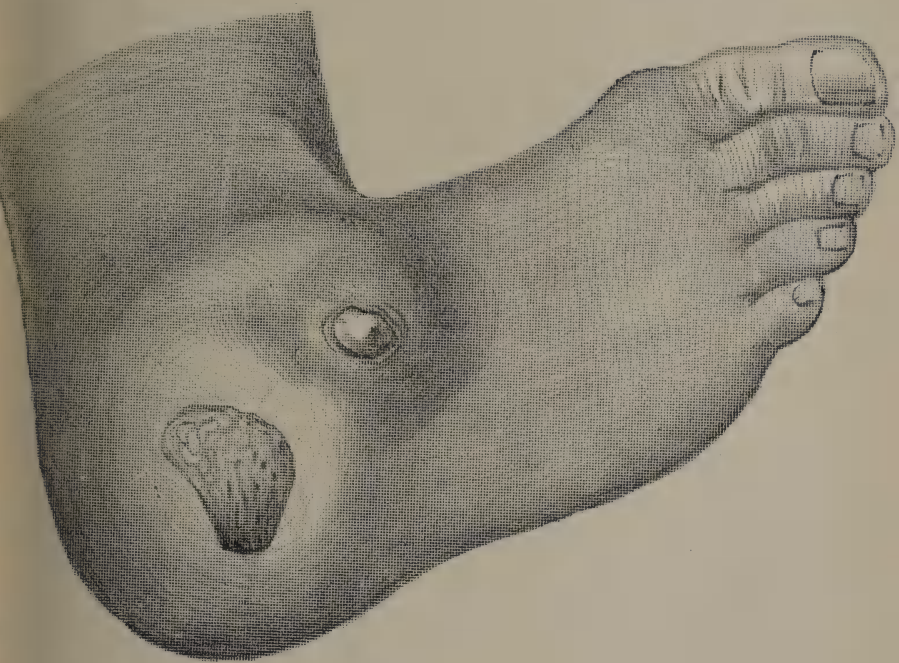


PLATE IV.

Mr. K.'s foot eleven days after accident. From original drawing by
Dr. Paul Carton.

clearly the condition which I have described. The cast, which I also exhibit, was taken a few days before the operation. On examining it, and contrasting it with the cast which I show of the sound foot, it will be observed that the description is in no way exaggerated. The patient was anæsthetised, and the limb thoroughly prepared by my son, Surgeon Henry Croly, who was my chief assistant. I made a longitudinal incision, and came down at once on the head of the astragalus. I then found that the upper articulating surface was rotated outwards, the bone was firmly wedged in its abnormal position, and required some dissection and leverage with a "lion forceps" to remove it. *Immediately on removal of the astragalus (which I now exhibit) the foot came straight.* I applied a simple back splint with foot-piece, and had not any trouble in keeping the foot in a normal position. The patient bore the operation well, had no temperature worth recording, and, except a rapid pulse and much broken sleep, he made in the long run a most satisfactory recovery. He suffered from a sharp attack of eczema, chiefly confined to the affected limb, which is now much better. He walks out in his grounds, enjoys the fresh sea breeze, has a *movable ankle*, and very little shortening.

Measurement of legs:—

Injured leg—From inside of patella to ball of great toe, 18 in.; sound leg, do., 19 in. Injured leg—From point of heel to ball of great toe, 7 in.; sound leg, do., 7 in. Injured leg—From inside of patella to front of heel, 18 in.; sound leg, do., 18 in.

Considering the age of this gentleman, the very severe and dangerous accident from which he suffered, and the complications which arose, I look on the happy termination as regards life and limb as one of the most important surgical triumphs, under Providence, which has occurred in my practice as a surgeon; and my best thanks are due to my son, Surgeon Henry Croly, M.D., for the valuable assistance which he rendered at the time of the operation and in the subsequent dressings. To the patient's invaluable nurse, "Mary," all praise is due; and to the patient's brother, Mr. John —, for his untiring attention to dietetic comforts.

Dislocations of the astragalus may be divided into two principal classes—those in which the astragalus is displaced

from the os calcis and scaphoid bone, the joint of the ankle not being affected; and those in which the astragalus is dislocated from these bones and from the tibia and fibula also. The first are incomplete luxations, the second complete. The incomplete have been called *sub-astragaloid* by Broca, the complete have been called *double* dislocations by Boyer, a nomenclature adopted by Malgaigne.

Sub-astragaloid may take place in four directions—forwards, inwards, outwards, backwards. They are frequently complete as regards the astragalo-scaphoid articulation, but incomplete as regards the calcaneo-astragaloid articulation. In the forward (sub-astragaloid) the head of the astragalus completely leaves the cavity of the scaphoid bone, and rests on the scaphoid and cuneiform bones. The body of the astragalus is thrown more or less forward upon the os calcis, its posterior sharp edge rests in the groove which separates the two articular surfaces of that bone, hence the difficulty in effecting reduction. In this case the joint of the ankle remains uninjured. The head of the bone being constricted in the narrow opening in the capsule, or the head of the bone getting between the tendons, or the wedging of the astragalus between the tibia, os calcis, and os navicular, may each contribute towards rendering reduction difficult.

In dislocations inwards (sub-astragaloid) from the calcis and scaphoid, many cases are compound at the time or become so by sloughing, and are often accompanied by fracture of malleoli.

In dislocations outwards (sub-astragaloid) from os calcis and scaphoid the foot is inverted, while the head of astragalus causes a prominence upwards and outwards on the cuboid.

In dislocations backwards from os calcis and scaphoid (sub-astragaloid) the anterior of part of the foot is lengthened.

On reviewing the cases which I have described as occurring in my own practice, of fractures and dislocations of the



PLATE V.

Showing appearance of inner side of Mr. K.'s foot eleven days after accident.

astragalus, and the cases which I have referred to recorded by surgical writers, I have come to the following conclusions, that:—

1. The term “sub-astragaloid” is confusing and misleading.
2. In dislocation of the astragalus the bone is either *partially* or *completely* separated from its surrounding articulations, and if a wound exists, and any portion of the bone protrudes, it is compound. The direction in which the bone is displaced is specified by the terms forward, backward, outward, inward, &c., &c.

3. In compound dislocation, with the head and neck protruding, the bone is so enucleated that its vascular supply is cut off, and though reduction might be effected, necrosis is certain to follow, necessitating the excision of the bone later on, meantime risking the patient's life by causing suppuration and septic trouble.

4. In compound fractures the sooner the bone is excised the better, the joint being drained.

5. In all simple partial luxations reduction should be attempted, and most probably success will be the reward of such praiseworthy efforts on the part of the surgeon. Tenotomy of the achillis-tendo or tibial tendons may in some cases be considered necessary.

In the complete simple or double luxation, where the astragalus has left its box, *no efforts on the part of the surgeon will effect replacement of the bone*, and if its articular surfaces have undergone a change of position the bone must ultimately necrose. I advise immediate excision in these “*Listerian*” days as safer than allowing the bone to slough out, which always happens except in cases of luxation backwards, when it may be allowed to remain.

Mr. Turner says, in his experience in the majority of cases of dislocation of the astragalus, there is an accompanying fracture of the bone. The bone may be fractured in the operation of extracting. Larrey and Boyer are in favour

of extracting at once. It may be summarily stated in simple, direct, and complete luxation Turner advocates allowing the bone to remain in its new situation without any operation until it manifests a tendency to ulcerate the skin. To relieve tension an incision may be made over the dislocated bone, but its removal should be postponed. In complete compound luxation he advocates immediate removal.

Boyer says after the astragalus is extracted the tibia is approximated to the os calcis. The movements of the foot are abolished, and the member loses a part of its length equal to the height of the astragalus.

Boyer dissected a limb of a patient of Desault's, and found the tibia almost ankylosed with the calcaneum, but it does not follow that ankylosis should result.

Mr. Smith (Leeds) says his patient in each case had an excellent hinge-joint of the tibia on the os calcis.

In incomplete luxations of the astragalus the hook-like process of the astragalus may get fixed in the groove of the os calcis.

In dislocations backwards, allowing the bone to remain in its new situation has been most satisfactory.

Broca's classification of luxations of the ankle-joint has been adopted by surgical writers—viz. :—

1. Tibio-tarsal dislocation.
2. Sub-astragaloid dislocation.
3. Astragalus dislocation (or enucleation).

In my paper on compound luxations of the ankle-joint I entered fully into these important cases. My subject to-night is dislocations, simple and compound, of the astragalus proper, and on fractures of the bone.

Sub-astragaloid luxations are cases where violence having been inflicted, such as severe wrenches of the foot in running or jumping, the head of the bone is dislocated from the scaphoid, and rests on the dorsum of the foot



PLATE VI.

- Fig. 1.—Mr. K.'s foot before operation. From cast.
 Fig. 2.—Appearance of Mr. K.'s foot one year after operation.
 Fig. 3.—Astragalus removed.



PLATE VII.

Mr. K. eighteen months after accident. From photo.

externally or internally, *whilst the body of the astragalus remains in its box*. The differential diagnosis of sub-astragaloïd luxations of the foot from partial luxations of the astragalus is, to say the least, not by any means easy even to experts. The appearances of the foot are almost identical, and reduction under chloroform can be effected in many instances. In each case if reduction cannot be effected the astragalus must be excised, either at the time or as a secondary operation.

Fractures of the astragalus as primary accidents are very rare. Fractures of the neck as complication of luxation are not uncommon. The case of fracture which occurred in my hospital practice was caused by direct violence, the foot being caught in the stirrup when a horse fell heavily on his side. I exhibited the astragalus at a meeting of this Section. Excision of the bone is the proper treatment in such accidents, a very useful foot being the result.

In dislocations, complete or incomplete, an attempt should always be made to effect reduction. The patient should be anaesthetised, the leg flexed on the thigh, and the thigh on the pelvis, and extension made from the foot, the thumbs being applied to press back the astragalus. It may be necessary in very difficult cases to perform tenotomy of the *achillis-tendo*. This practice was advocated and practised by Mr. George Pollock, Surgeon to St. George's Hospital, London. Before the days of aseptic surgery many surgeons hesitated before excising the astragalus at the *time* of the *accident*, preferring to operate when sloughs formed and nature attempted to expel the bone as a foreign body.

The vascular supply must be cut off in complete luxations; necrosis follows, operative measures therefore are called for.

DOUBLE OR COMPLETE DISLOCATION OF THE ASTRAGALUS.

In these cases the astragalus is displaced all from its articular connections—from the tibia and fibula as well as from the

scaphoid and os calcis. These, like the partial or sub-astragaloid luxations, may take place in various directions—forwards, inwards, outwards, backwards, and also a rotatory dislocation—*luxation par rotation sur place* (Malgaigne)—in which the bone remains between the tibia and os calcis, but undergoes a movement of rotation on its vertical axis, and a dislocation *par renversement* in which the bone becomes turned upside down.

In compound luxations of the astragalus the connection which the bone maintains is important—that portion of the bone forming the ankle-joint contributes nothing to its nutrition, the supply reaching it chiefly from its inferior surface.

When the astragalus has escaped entirely by the wound, even though it may preserve its connections with the tibia and fibula, the reduction would be followed by necrosis.

If bony ankylosis occurred the shortening of the limb should be greater than usually follows where granulations fill up to a considerable extent the gap left by excision of the astragalus. The anterior edge of the tibia is received in the cup of the scaphoid, and the cartilaginous surface of the tibia is brought into contact with the os calcis—a favourable condition for the formation of a false joint.

Malposition, or altered axis, are causes rendering unsurmountable barriers to reduction. In lateral dislocations there is usually fracture of the malleoli.

A dislocation of the astragalus forwards occurred to the late Mr. Carmichael, F.R.C.S., of this city, caused by a fall from his horse. Reduction was effected by Messrs. Hutton and John M'Donnell. Result good.

Malgaigne mentions 26 examples of double or complete luxation—viz., 15 forwards and outwards, 7 directly forwards, and 4 forwards and inwards. Of the 26, 9 were simple and 17 compound. Forced extension of the foot is the most

frequent cause of the dislocation forwards, and if there is inversion or eversion the bone takes, in addition, an oblique direction outwards or inwards. A case of complete simple dislocation forwards and outwards is recorded by Desault and another by Dupuytren. Two others are recorded by Guthrie. When the astragalus is dislocated obliquely forwards and inwards the sole of the foot is directed outwards and the outer edge of the foot is raised; the head of the bone is directed downwards towards the sole of the foot.

In compound luxations, with fracture of the neck separating the head from the body, the bone should be excised, the vascular supply being cut off necrosis would follow.

DOUBLE OR COMPLETE DISLOCATION OF THE ASTRAGALUS BACKWARDS.

Two cases are recorded by Mr. B. Phillips. The achillis-tendo was pressed backwards by the displaced astragalus. Reduction was impracticable. Liston, Lizars, Nélaton, and Turner describe similar cases. In one case the astragalus diminished in size as if by absorption.

ROTATORY LUXATION OF ASTRAGALUS (LUXATION PAR ROTATION SUR PLACE).

The astragalus in some cases may undergo a rotation on its vertical axis, so as to be placed transversely, or with its head directed towards the achillis-tendo.

Malgaigne gives four cases. In one by L'Aumonier the head of the astragalus protruded through the skin under the malleolus internus, between the tendons of the tibialis posticus and flexor longus digitorum, its trochlea being situated transversely, holding the tibia and fibula apart. In another, Denonvilliere found the body of the astragalus separated by a fracture from the head of the bone, and rotated so as to cross the calcaneum at a right angle, with its trochlear surface protruding through the integuments.

DISLOCATION "PAR RENVERSEMENT."

Dupuytren, Malgaigne, and Mr. Smith, of Leeds, describe such cases.

Mr. Smith, of Leeds, gives two cases of "excellent hinge joints." Phillips gives two cases of hinge joints.

Some authorities recommend the removal of the bone, even when not irreducible, if it has been much separated from the surrounding parts, fearing that the loss of vascular supply would occasion its necrosis. It must be remembered that the astragalus is peculiarly circumstanced in this respect, by far the greater part of its surface being articular, and a very small portion, comparatively with other bones, being available for the entrance of blood vessels. On this point Malgaigne observes that the question of reduction in compound dislocation of the astragalus depends entirely, in his opinion, upon the connections which the bone has preserved with the surrounding parts, and it is important to remember that this portion of the bone forming the ankle-joint contributes nothing to its nutrition, the elements of which reach it chiefly by its inferior surface. When the astragalus has escaped entirely by the wound, though its tibial and fibular attachments remain, necrosis is almost sure to follow. Malgaigne refers to 8 cases of reduction—3 were fatal and 1 ended in caries.

Chassaignac mentioned, in 1860, the necessity for amputation of the leg in these cases.

In the proceedings of the Surgical Society of Ireland, Feb. 22, 1865, two cases of dislocation of the astragalus were communicated by the late Dr. John Ridley, F.R.C.S., Surgeon to the King's Co. Infirmary. Case I. was one of compound dislocation forwards and outwards, in which the astragalus was removed at the time of the accident with the most satisfactory result. Case II. was also compound, in which reduction was effected with complete ultimate recovery.

In 1843 Dr. Morrison, of Newry, recorded a case of complete dislocation backwards of the astragalus. The bone was removed at the time of the accident, with perfect recovery.

The late Professor Williams and Mr. Tufnell placed on record two cases. Mr. Williams's case was luxation backwards; the bone was allowed to slough out. The result was not good as regards usefulness of the limb. In Mr. Tufnell's case, at which I assisted, the bone was thrown forwards, reduction was effected, and a useful limb resulted.

A case of compound luxation of the astragalus occurred in the practice of the late Mr. O'Reilly, in which the bone was reduced.

The late Mr. Jameson mentioned a case of luxation forwards and outwards of the astragalus, in which reduction was effected under chloroform. The limb was completely restored to use.

In the *Medical Press* of March 1, 1865, my friend, Dr. Henry Hadden, F.R.C.S., published a very interesting case of compound fracture of the astragalus, with dislocation of its head forwards and outwards. The bone was successfully removed; the patient recovered, with a most useful foot.

In St. Thomas' Hospital Reports on sub-astragaloid luxations, the writer says:—"Foot violently in-twisted, and adducted like talipes varus. Outer malleolus very prominent, *inner could not be perceived*, so deeply was it buried." Surely if the astragalus remained in its box the symptoms described above as *sub-astragaloid* could not be present.

Broca collected 78 cases of *simple* dislocation of the astragalus—of these 59 were irreducible, 19 were reduced.

Twice immediate extraction was performed—once successfully and once followed by death.

Secondary removal of astragalus was performed 25 times—24 recovered, 1 amputated.

Broca's statistics further show that about one-third of

the cases terminated fatally in *primary excision* of the astragalus, and no death occurred in the *secondary* operations. Eighty cases (compound) reduction in 14; 9 recovered well; 5 recovered after secondary extraction; 3 died; reduction impossible in 68; 2 died from shock; 5 amputated; 3 died; 2 recovered. Immediate excision gave in 57 cases 41 recoveries, 16 deaths. Complete removal of astragalus—86 cases, 17 deaths; primary excision 59 times, 17 deaths; *secondary excision* 27 times without a death.

A case is recorded by Norris, of Pennsylvania, in which the astragalus was completely expelled through a wound on the outside of the ankle, and was picked up from the ground. The patient died of tetanus.

In a paper on sub-astragaloid luxations of the foot, in St. Thomas' Hospital Reports, the writer says:—"Probably in most cases where it is needful to amputate, Symes's, Pirogoff's, or even Dupuytren's sub-astragaloid operation could be performed with advantage." Same writer says:—"The most desirable result that can follow excision of the astragalus is ankylosis of the foot to the leg, and the treatment should aim at procuring this."

In compound luxation the sooner the bone is excised the better. No cases demand immediate diagnosis and prompt treatment more than the luxations and fractures of the astragalus.

In the compound luxation case which I have described the neck and head of the bone protruded. I excised immediately. The bone was detached from all its ligaments, and portion of the bone near the groove for the flexor pollicis tendon was fractured. I saw the young man quite recently; he is driving a van, and can jump up and down, and is not lame. His foot is as useful as the uninjured one.

The case of Mr. K., aged sixty-nine years, was one of unusual severity. When I saw him, eleven days after

the accident, his condition was most alarming; two large ashy-grey sloughs formed, one at the inner side of the foot, the second over the external malleolus, and a shiny spot over the head of the astragalus. The heel also was deeply ulcerated from splint pressure. The pulse was rapid; temperature high; tongue furred and dry; considerable dyspnœa; bronchial râles; and almost sleepless nights. I dared not operate under such circumstances.

The patient's residence at the seaside was most favourable for the improvement of his general condition. He took plenty of light, nutritious food; the sloughs were carefully dressed with aseptic dressings; the limb supported on pillows; tonics and bromides were given to quiet the nervous system. The astragalus was not only displaced completely from the tibia and os calcis, but was rotated outwards. There was wedging, and adhesions existed which necessitated a careful dissection, the bone being held firmly in the lion forceps. There was not any fracture of the astragalus, or of the tibia and fibula. This gentleman, whose foot has been examined by the members, has a *movable ankle*—can flex, extend, and walk well.

It will be seen from the above statistics that, *before the days of Listerism*, primary excision of the astragalus was by no means favourable as regards life, whilst *secondary* removal of the astragalus was very favourable.

I advise *immediate* excision in all cases of irreducible luxation of the astragalus in this "*Listerian*" period.

PROFESSOR E. H. BENNETT expressed the thanks of the Academy to Mr. Croly for his most practical and complete communication, which was one of the most important he had known in his experience.

MR. W. I. WHEELER mentioned a case of dislocation of astragalus backwards, the result of a blow by a cricket ball on the front

of foot when in the flexed position. Efforts to reduce the dislocation were unsuccessful; although it was never reduced the patient to this day has a most useful foot. The question of waiting until a slough occurs, or removing the bone, or touching it at all, was very important. It depended on the circumstances. He had seen cases of slight partial displacement which were left alone and the patients had very useful limbs afterwards. If the astragalus were displaced so much as to act as a foreign body he would advise immediate removal. Referring to a case under his care, mentioned by Mr. Croly, where the patient had fallen down the side of a mountain, and where the astragalus was removed about a month afterwards, he said that, curiously, the patient lost his mental balance. It was not traumatic delirium. Recovery ensued. Mr. Hancock's statistics of 109 cases of complete removal of the astragalus for compound dislocation, simple dislocation, and disease showed 14·6 per cent. death-rate.

MR. R. L. SWAN had seen one case of dislocation which was remarkable inasmuch as it bore out what Mr. Croly had said—the apparent facility with which the astragalus could be dislocated by accident. He had made several endeavours to imitate that force on the dead subject, because he had often had occasion to remove the astragalus for aggravated equinovarus in the adult. It is a very successful operation. In this operation he always had to remove the astragalus by piecemeal. He had never succeeded in getting the hammer and anvil described by Dr. Hadden. The results obtained by Mr. Croly seemed to show that the foot was really as good without the astragalus as with it.

MR. CROLY, in reply, thanked the members present, especially his friend, Professor Bennett, for his kind expressions regarding this communication.

DISEASES OF THE FOOT.

By W. I. WHEELER, F.R.C.S.;

Surgeon to the City of Dublin Hospital.

[Read in the Section of Surgery, March 3, 1899.]

BEFORE entering into the details of some of the diseases of the foot and their treatment, it will not be out of place to briefly refer to the anatomical points especially bearing on this subject. Putting aside the freely movable joints of the toes, there are three joints in connection with the tarsus that are capable of free movement in a direction of flexion and extension. The first is the ankle proper, between the tibia, fibula, and the astragalus; the second is the transverse tarsal joint, between the os calcis and cuboid and the globular head of the astragalus and the scaphoid; the third and last joint being that between the tarsus and the metatarsus. The other articulations of the tarsus permit of extremely limited motion, and their actions subserve the purpose of elasticity of the tarsus as a whole, rather than actual movement. The joint that is most intimately connected with the intrinsic movements of the foot is the astragalo-scaphoid, consisting, as it does, of an almost enarthrodial articulation, and partly composed of an extremely elastic ligament (the inferior calcaneo-scaphoid), which allows of considerable increase of mobility on account of its elasticity. The surface of the astragalus is much larger than the scaphoid, but its free movement on the latter is allowed by the ligament just mentioned.

In connection with these joints the synovial membranes become important. The largest and most complex is that which lines the anterior surface of the scaphoid, passing forward in three processes—one between the cuboid and

external cuneiform; one between the middle and internal cuneiform, and the third (by far the most important) passes forward, lining the contiguous surfaces of the middle and external cuneiform bones, and then passes between the anterior surfaces of the external and middle cuneiforms and the proximal surfaces of the second and third metatarsal bones, and also passes between the surfaces of the second, third and fourth metatarsals. This synovial sac seldom varies, sometimes allowing the prolongation between the internal and middle cuneiforms to join the expansion between the second metatarsal and anterior surface of the middle cuneiform, and thus the middle cuneiform may be surrounded with a complete synovial membrane. By means of this sac the following bones are in communication by their synovial membrane:—Second, third, and fourth metatarsals, the three cuneiforms, the cuboid and scaphoid—in fact, all the tarsus anterior to the transverse tarsal articulation. The other synovial membranes are not of such importance—(1) between the internal cuneiform and first metatarsal, (2) cuboid and third and fourth metatarsals, (3) calcis and cuboid, (4) posterior surface of astragalus and calcis—except one, that which lines the concave surface of the scaphoid, the convex head of the astragalus, the anterior articular surface of the scaphoid, and the calcaneo-scaphoid ligament. On account of the close bond between the bones of the tarsus by means of ligaments, the synovial sacs become related to a much greater extent by ligamentous structures than is the case in other articulations.

With reference to the arches of the tarsus, the antero-posterior arch is maintained not alone by the fascia muscles and ligaments that run in an antero-posterior direction, but also by the strong tendon of the *tibialis anticus* which is inserted into the keystone of the arch (the internal cuneiform bone); and the preservation of this arch is necessary

for the existence of the transverse half arch which completes the tripoid of which the internal cuneiform is the apex. In this connection may also be mentioned the tendon of the peroneus longus, which, by its insertion into the base of the first metatarsal bone, forms the opposing point to the half arch of the tarsus.

To epitomise what I have written—the tarsus, for practical purposes, may be divided into four separate or distinct synovial sacs, no one of them communicating with the other.

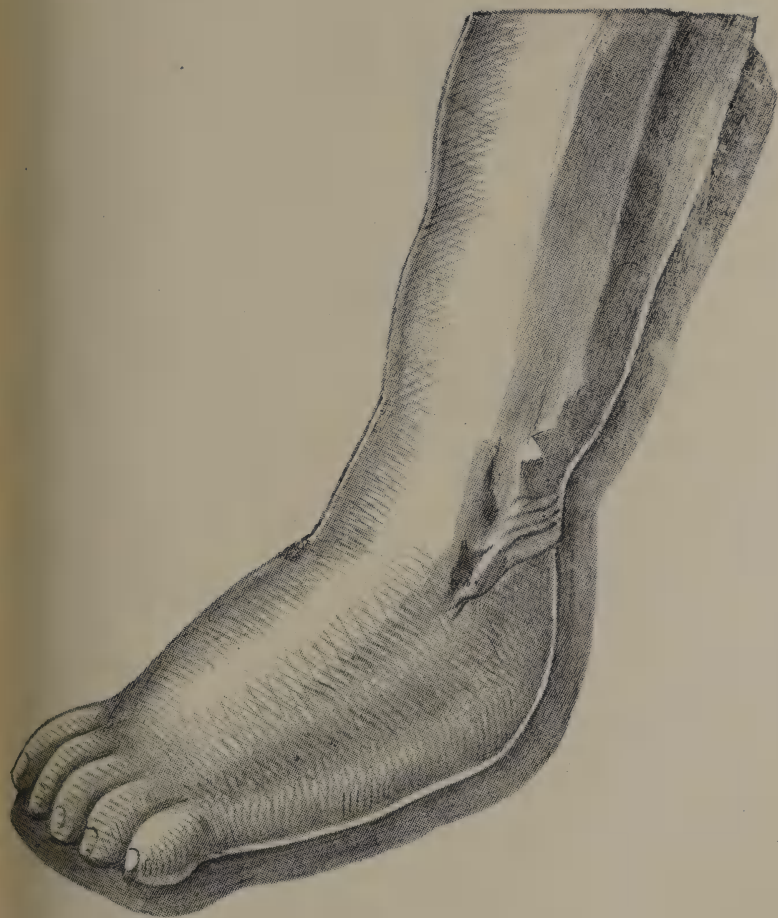
In nearly all the cases of carious disease of the foot that have come under my notice the osseous structures were primarily affected, and not the articulations; and on considering the arrangement of the synovial membranes, as above described, it will be readily understood that the original starting-point of disease will greatly influence its extent; thus, disease in the calcis extending to the cuboid will for a lengthened period be limited to these bones; but should disease commence in the middle cuneiform or in the bases of the second or third metatarsal bones, the rapidity of its progress will soon implicate the centre of the inner and front part of the tarsus.

Having thus briefly reviewed the anatomy of the parts, the first consideration that presents is the comparatively recent date that marks any attempt to advance the conservative surgery of the foot to the same level as that of its analogue in the upper limb—the hand. In a point of surgical interest, the foot is in no way of less importance. Its intrinsic movements, no doubt, are less; but, excluding the proper movements of the thumb, those of the foot are not inferior. Anatomically it is composed of just as complicated a series of structures; its powers of repair are not unequal to those of the hand; but within a measurable distance of time the surgeon who would preserve the smallest portion of the hand with

scrupulous care, would condemn the entire foot to amputation without sufficient hesitation. At no very distant date no distinction was made between the diseased portions of the foot, and those who suffered from diseased tarsus were indiscriminately condemned to amputation of the leg—the wealthy and affluent, who could afford suitable artificial limbs, above the ankle-joint; to the poorer classes, just below the knee; and thus not only was a limb perfectly sound removed, but the risk to the patient materially increased. And thus this practice prevailed until Chopart drew decided attention to the propriety of treating limited disease of the tarsus by operation other than amputation of the leg, when he introduced the medio-tarsal operation, or that called by his name. Syme's operation was another advance in conservative surgery; and, without doubt, the introduction and use of anæsthetics also assisted. But it is not my intention to enter into any detail or to discuss the modifications and relative merits of these many excellent operations devised for removing only the diseased structures of the foot—such as Lisfranc's, Hey's, Pirogoff's, the subastragaloid, Chopart's, Tripiér's, and others too numerous to be mentioned—but to shortly relate some of the more interesting cases of disease that have occurred in my own practice, the operations necessary for the removal, and the results.

I. Complete Excision of the Os Calcis for Carious Disease.

CASE I.—A. T., a young lady, aged nineteen years, above the middle height, of healthy appearance, suffered from carious disease of her left os calcis, which was said to have been excited by a fall when skating. Two years subsequently, when I saw her, an abscess had formed on the posterior and external surface of the os calcis, which had burst. On passing a probe into the small aperture which existed, the bone could easily be felt denuded and roughened to the extent of about the size of a shilling. An incision was made in the site of the opening,



MR. WHEELER

On Excision of Os Calcis, Astragalus, and Malleoli.

and potassa c. calce applied, commonly called Kirkpatrick's treatment, but more correctly it should be credited to Munroe *primus*. This line of treatment had not a beneficial effect. The disease extended, and I was obliged to excise the entire bone, which was done by making a semilunar incision, carried a little anterior to the calcaneo-cuboid articulation to a point corresponding on the opposite side. I dissected the flap forwards, and opened the calcaneo-cuboid articulation, divided the ligaments, and removed the bone. Dr. H. Benson administered the anæsthetic; my pupil, Mr. Corry, assisted me. Drainage was established, and the foot placed on a splint. The operation was performed in 1875; in three years after, when I saw the young lady, she walked almost perfectly. The heel of the boot on her right foot was made as low as possible, that on the left added to sufficiently to compensate for the deficiency.

II. *Removal of the Right Os Calcis for Carious Disease.*

CASE II.—G. A., a sailor residing in Dalkey, was admitted into the City of Dublin Hospital, under my care (in 1877), on the recommendation of my friend and colleague, the late Mr. Tufnell. There was not any history of injury. He stated that a sudden pain came in his heel, which he attributed to cold and wet when fishing; and this was followed by abscess, forming a sinus which led down to roughened bone on the inferior surface near the centre. The sinus was enlarged, and sulphuric acid injections resorted to; afterwards iodine. The treatment did not control the disease; the bone softened, and became carious to a greater extent. I decided to excise it, which I did after the manner before described. The under surface of the astragalus was roughened at the inferior posterior surface, which I removed, taking off a thin section of bone by means of a fine saw. The patient made an excellent recovery, and is still to be seen at Dalkey following his accustomed avocations.

III. *Excision of the Os Calcis for disease which attacked the inferior and external surface, the articular surfaces being healthy.*

CASE III.—R. T., a young gentleman, aged twenty-one years, born of healthy parents, about five feet eight inches in height, of sallow complexion, for whom I was consulted in October,

1880, for pain over the external portion of his right os calcis, on which surface was a small opening which occasionally closed and then again burst, discharging a thin fluid. He was seen by Mr. Butcher, who advised injections and subsequently removal of the diseased bone by the gouge. A month after I first saw him—that is, about the 20th November, 1880—he was placed under an anæsthetic by Dr. Harley. Mr. Butcher and Mr. Tufnell were present. It was now ascertained that the disease was so extensive that excision of the bone should be practised, which I did by the sub-periosteal method. The external incision, which was curved, commenced on the outside of the tendo-achillis, at the level of the ankle-joint, and was carried down to the tuberosity on the external surface of the os calcis, and as far forwards as the base of the fifth metatarsal bone. The flap having been raised, I separated the periosteum carefully. This operation was long and tedious. The periosteum did not strip off easily from the bone, as we are wont to observe in disease. Small particles of the bone remained adherent to the periosteum. The progress of the case was slow, and portions of bone were thrown off during the treatment to cure, which was eventually accomplished in two months after the operation. In two years after the operation (1882) the patient walked well. I could not satisfy myself that there was any reproduction of the bone. I have excised the os calcis twice since; I did not adopt the sub-periosteal method. This operation does not possess the advantages claimed for it, and to my mind it has many disadvantages; besides, the periosteum is often diseased, and does not, after operations, always carry out its wonted functions. [The excised bones were exhibited at the Pathological and Surgical Societies.]

IV. Complete Excision of the Right Astragalus for Disease.

CASE IV.—In March, 1881, I was consulted by the parents of a healthy young lady, nineteen years of age, for caries of her right astragalus. The exciting cause of the disease appears to have been a blow over the bone a year previous, which occurred when running upstairs, when she slipped and fell forwards, the edge of the stair step causing a severe contusion over the front of her ankle-joint. This accident confined her to bed for a week, after which period she resumed her active country life. She continually felt stiffness and aching pain in the neighbourhood of

her ankle-joint, especially after exercise. Two months before I saw her—that is, early in January, 1881—without any known immediate cause, an abscess formed in the front of her ankle, which rapidly ran its course, and burst in about a week after the first acute symptoms, leaving two sinuses. On entering a probe into the most anterior, that part of the astragalus just behind the head could be felt exposed, and on passing a probe into the sinus anteriorly and externally, the denuded bone was easily reached. Having examined this patient on two occasions, I advised the removal of the astragalus. The lady was anæsthetised by Dr. Harley. Mr. Butcher was present, and Mr. Kelly (now Dr. Kelly), my former pupil, assisted. I made a somewhat curved incision from the external malleolus, and extended it to the outer border of the foot, passing through the sinuses. I divided portion of the external lateral ligament of the ankle-joint, the peroneus brevis tertius and short extensor of the foot. The extensor tendons in front and the dorsalis pedis vessel were not injured. The peroneus longus muscle was retracted posteriorly. I next turned the foot forcibly inwards, and divided the ligamentous attachments, and then seizing the bone with a lion forceps I drew it forwards, and further divided any structures necessary, being careful not to injure the plantar arteries on the inner side. There was not any hæmorrhage of consequence. A few muscular branches were ligatured; the cavity, which I had previously examined, I washed out with a solution of chloride of zinc, 15 grains to the ounce in strength; drainage was established; and the foot and limb was placed on a splint, such as is commonly used in excision of the ankle-joint. The wound progressed kindly, and in a little less than three weeks had completely healed. Before the end of the fifth week I applied a plaster bandage, which remained on for six weeks, which allowed some slight motion. Suffice it to say that the result is all that could be desired—the limb but little shortened, her power of locomotion scarcely impaired, and a movable articulation exists between the os calcis and malleoli. The lady, who is in town at present, I saw about a week ago.

A gentleman of position when fishing in the County Kerry, and returning homeward lost his way, and when descending a high mountain slope fell and incurred a compound dislocation of his left astragalus. He crawled

on his hands and knees to the nearest house, about three-fourths of a mile distant, reaching the house about 9 30 p.m. on a winter's evening, but he was refused admittance because, as he afterwards learned, the inmates thought he must be a "Moonlighter," a term well understood in that county. When found the following morning he was much collapsed. Finally he was treated in Limerick, and, for reasons I need not detail, I was requested to admit him into the City of Dublin Hospital, where I removed his astragalus. Eventually he left the hospital with an admirable result, similar in almost all respects to the preceding case, except that there was not quite so much motion, probably by reason of his being much older than the subject of the similar operation I have just recorded.

I said he eventually left this hospital, for after the removal of his astragalus he completely lost his mental balance. He became delirious, sullen, and frequently refused his nourishment. Sir John Banks (then Dr. Banks) saw this gentleman in consultation with me during this attack. I had noticed and have since seen in my practice, and have had the opportunity of observing in the practice of others, this loss of mental balance in patients after operations, and nearly always in patients of temperate habits—sometimes assuming rather a cheerful form, and again the depressed form, as the subject of this description did; in no way like the traumatic delirium of Dupuytren, for these patients never attempt to disturb the dressings or appliances. I have never seen such cases end fatally.

V. Medio-Tarsal Operation.

CASE V.—The next case which I shall record is one which required the medio-tarsal, or Chopart's amputation, which I performed some five years ago for disease, commencing in the middle cuneiform bone, which extended to the external and internal cuneiform, 2nd and 3rd metatarsal and scaphoid bones.

The subject of this operation was a delicate lad about eleven years of age. There was not any history of injury. The result of this operation was seen at the Surgical Section. The photograph here shown represents the stump three months after the operation. There was no tendency to contraction. When bringing the flaps together, I sutured the tibialis anticus and peroneus longus to the cutatrix.

Twelve other medio-tarsal operations I have records of were very similar to the one recorded, all having been operated on for caries, the result of injury or neglect—one being for perforating ulcer of the foot, communicating with dead bone, in a young woman, thirty-two years of age. Writers have stated that the term ulcer is “a misnomer,” no true ulcer being present, but an opening communicating with a sinus surrounded with granulations, the adjacent skin being only slightly inflamed; I have, however, seen the skin extensively ulcerated. The most usual position for this ulcer is said to be over the metatarso-phalangeal joint of the first or fifth toes. The discharge is thin and sanious, and on passing the probe diseased bone can invariably be felt. There is usually extreme insensibility of the diseased part, and anaesthesia exists over a large and irregular area. In the patient alluded to the sensibility of the toe was much lessened and the local temperature lower. Increased epithelium formation is said to occur upon the sole and dorsum of the foot, and the depth of the colour of the skin is increased. The changes result from the thickening of the endoneurium, with compression and destruction of the sensory nerve fibres. Injury of the foot, with a peripheral nerve injury, may cause perforating ulcer.

The prognosis in such cases should not be given without careful consideration. I have known, on more than one occasion, young practitioners and inexperienced surgeons treat this affection lightly, and assure their

patients of a speedy recovery, not being aware of the magnitude of this ailment.

VI. Excision of the Os Calcis, Astragalus, and portions of the Tibia and Fibula for Disease.

CASE VI.—E., a gentleman about forty years of age, was admitted into the City of Dublin Hospital under my care in October, 1885. He gave the following history:—

“Whilst in India, 14 years since, a buggy wheel went over my left foot, which discoloured the instep and caused me to be lame for a short time. Again, about five years since, the same foot was a second time run over, which in no way inconvenienced me for about three years. It then pained me on walking much, and eventually became swollen, and a sinus formed last March two years, which was cured in about two months. On using the foot again the ankle became much swollen and painful. I was then directed to give it rest and apply cold lotions. The foot did not improve, but became more painful, with constant twitching. Then for a long time I applied hot stupes with no good results, blisters were applied, and eventually iodine. Not having improved, I went by advice to China for change of air. Having returned from China, it was found that an abscess had formed, which was lanced. I remained in Calcutta for ten days, and was told that the bone was not diseased, and that I might return to my district. It had, however, soon to be lanced again, which was repeated on several occasions. Before leaving Calcutta a large quantity of the flesh which was between the sinuses on the inside of my ankle was removed. During the voyage another abscess which formed on the outside of my ankle had to be lanced. When I arrived in London I went to St. Thomas's Hospital, where Mr. — was of opinion that the bones were not implicated. He repeatedly lanced and scraped the sinuses, also giving medicine internally, and he was of opinion, from the way I progressed, that I would be quite well in two months. I attended at St. Thomas's Hospital for a little over three months, and then left for Dublin, October, 1885. On arrival I had an attack of ague, which I had never suffered from in India.”

On examining this patient in the City of Dublin Hospital there was not any difficulty in discovering that his os

calcis was extensively diseased: Four sinuses led down to diseased bone. In a few days after I passed a probe into the inferior sinus, which penetrated the astragalus. The motions of his ankle-joint were not impaired, and pressure of the astragalus against the tibia did not cause him any pain whatever.

Having fully explained to the patient the nature and extent of the disease, I told him of the operation I proposed to perform. It was a great matter to him to have the anterior portion of his foot sound, as it would enable him to ride on his return to India. Formerly an indigo planter, now the manager of an indigo plantation, it was a matter of the utmost importance that he should as speedily as possible return to his business. I was obliged, however, to delay the operation for a while on account of his attack of ague.

The operation was performed in this way:—A semilunar incision was made, such as I have described for removal of the os calcis, keeping, however, a little higher up at the posterior surface, and dissecting the flap forward. The calcaneo-cuboid articulation was next opened and the ligaments of the ankle-joints divided; the astragalus and calcis now separated, so I removed the latter bone and afterwards the astragalus. Having seized it with a lion forceps I forcibly brought it forwards and opened its articulation with the scaphoid bone. I next removed the malleoli, and with the internal the articular surface of the tibia. The flap was now adjusted and placed in apposition, but not pressed firmly. The lines of incision healed slowly. He was not discharged from hospital until April last, when he could bear a tolerable amount of pressure over the seat of operation. The bones which you now see show carious disease. The inner malleolus was rough, and the articular surface of the tibia congested and ecchymosed. The cast, which represents the foot after operation, was taken in

August last, at which time he was able to wear a properly-adapted boot and walk fairly well, with the assistance of a stick. I received a letter from this gentleman some months ago, in which he gave me the most favourable report of his locomotive progress. The lithograph, taken from the cast, admirably shows the condition of the foot after operation.

I shall not recount in detail any of the other operations that I have successfully performed on the foot—as Syme, Hey, Lesfranc, Pirogoff, and Tripier—but may add that in addition to these recorded I have records of removing the cuboid bone 9 times, the scaphoid 13 times, the middle cuneiform once, several times the metatarsal bones, and I have 6 times resected the first phalango-metatarsal articulation. The results of these operations were satisfactory.

I have practised erasion of the ankle-joint by lateral excision twice, but I have not found the operation followed by the results expected, and my experience has taught me to prefer Syme's operation or amputation of the leg in preference to erasion.

Tripier's operation I practised on two occasions. In my opinion it has as many advantages over the subastragaloid operation as Chopart's has, but has not the advantages claimed over the mediotarsal operation, except with those who believe that in Chopart's operation the astragalus is thrown forward against the scar, which is quite preventable in a properly executed mediotarsal operation, and does not occur when the plantar flap is made sufficiently long.

I have never performed Mickulicz' operation. Constant pain has frequently followed after; and the account given in the *Lancet* of 1893, page 1513, of the result that followed this operation is not encouraging, although the specimen showed that the intention of the surgeon had been anatomically fulfilled.

I must refer to three affections of the foot not commonly

met with. The first I would record is that affection described as *Podelkoma*. I have only seen two cases of this disease—one, a male, who was treated by me as an intern in the City of Dublin Hospital, and made an excellent recovery, but was re-admitted with a return of the disease a year and a half afterwards. The second, a female, aged forty, with this disease in her left foot, so graphically described by Professor Miller. His description is so illustrative of my cases, and so accurately describes the appearances, that I quote from him. A peculiar ulcerative affection attacks the foot, commencing about the toes, creeping upwards, and at length reaching the ankle. The part is studded with numerous small sores, and the skin and areolar tissue are at the same time hypertrophied. The skin is hard too, giving so far an indolent character to the ulceration. A thin, fœtid, unhealthy discharge oozes away, and sometimes burrows deeply; but there is little inter-communication of the sores.

From time to time fresh inflammatory attacks may occur, causing abscesses, with rapid extension of the sores, which are then prone to assume the characters of sloughing phagedæna. Bye-and-bye the nails drop off, and the matrix ulcerates; the phalanges become carious, and ultimately the metatarsal bones are similarly involved. The os calcis often suffers at this early period. Pain is always considerable, and the system is weak and miserable. Sometimes the young are affected; more frequently those of middle life.

The disease is but little amenable to treatment. In the less advanced cases rest, bandaging, and the more powerful alteratives—both local and constitutional—may effect cicatrisation, but the part is prone to relapse. In many cases amputation is ultimately required.

This uncommon affection of the foot has been mistaken

for other diseases—indeed, I once heard it stated at a society meeting that the name Podelkoma was given by the late Professor Miller “to puzzle students.” Need I add that such a statement emanated from a source not considered authoritative nor always responsible. This ulceration has been mistaken for tubercular disease, but injections of the discharge in lower animals has not proved it to be so.

The second metatarsalgia I shall allude to is better known, and it was described in the *Lancet* of 1889 by Dr. Augusta Pollasson as anterior metatarsalgia, when the distal phalangeal joints are alone affected; but the metatarsal phalangeal joints, I think, are more frequently affected. The symptoms and pathology do not differ. From long standing or walking in tight boots the ligaments of either of the above-mentioned joints become strained, alternation takes place, and the nerves are pressed upon, or perhaps stretched, by the partial bone dislocation, and severe pain is produced. The pain comes suddenly, with a feeling of something having given way in the joint. Relief is obtained by taking off the boot and replacing the bones. Sharp pain occurs with the reduction, and sometimes there is an audible click at displacement and reduction. This affection has frequently been diagnosed by physicians as gout. The affection is generally curable without operative interference.

The third I shall allude to is madura foot, which I have only seen once; it was the yellow variety. The subject thus affected was a male, about twenty-nine years of age. There were numerous cavities in the soft tissues of the foot filled with yellow particles; the disease is due to a fungus. There is another variety described, the black form, said to be a degeneration of the yellow. Microscopically, rays could be shown which closely resembled ectinomyces.

It may not be uninteresting to review briefly some of the operations I have brought before this Section.

The first excision of the os calcis appears to have been performed by M. Robert, in 1837; and the first in England by Greenhow, about ten years later. I shall not discuss the advantages claimed for the various incisions recommended for the removal of the entire os calcis. Such can be found in the various works on surgery. I prefer the method which I have recorded, which is very similar to that mentioned by Erichsen, except that I do not make the perpendicular incision, and consequently have only the one flap—horse-shoe in shape. In making the external incision the operator should be careful not to divide the tendon of the peroneus longus as it passes through the groove in the cuboid bone. Many surgeons have condemned this operation; the late Sir William Fergusson said he never found it necessary to perform such operation; Syme and Lisfranc also disapproved of it; others urge that on account of the large size of the bone—the important part that it takes in support—that its complete or even partial extirpation should be delayed as long as possible. This latter statement, indeed, appears to me to be erratic in principle, and to be one of the many reasons why the removal of the calcis may subsequently be followed by disease in other bones. I must not be understood as advocating excision of this bone without due and careful deliberation, but I wish emphatically to express my disapproval of any half measures when disease is evident, and established statistics declare that it is a favourable operation, and affords results that could scarcely be anticipated. Dissection has proved that dense tissue occupies the former situation of the bone into which the tendo-achillis is inserted, and the short flexor muscle of the toes, together with the abductor pollicis and minimi

digiti, lose themselves. The cuboid bone inclines backwards towards the astragalus, to which it is frequently united by fibrous bands.

Complete excision of the astragalus for displacement is undoubtedly of ancient origin, but for disease is of comparatively recent date. In England up to 1864 only three cases of complete removal for disease had been recorded. Assuredly, if there should not be undue delay in removal of the os calcis, greater expedition is called for when disease occurs in the astragalus. Experience has shown that amongst all the bones of the tarsus it takes a foremost place in rapid implication of adjoining osseous structures. The surgeon will act well to his patient who advises early removal of the astragalus when diseased. This operation, according to the most recent statistics, is very favourable. Mr. Hancock gives 109 cases of complete excision of the astragalus for compound dislocation, simple dislocation, and disease, out of which number 76 recovered, 16 died—a death-rate of 14·6 per cent. Of the 10 cases quoted by Hancock operated on for disease, 6 recovered with good and useful limbs, 1 underwent secondary amputation and recovered, 1 died, and in 2 the result is not stated. Mr. Gant records 14 cases of complete excision of the astragalus for disease. Of these, 9 recovered, 2 underwent secondary amputation and recovered, in 2 the result was not reported, and 1 died. Excision of this bone appears to have been first performed in 1582 by a surgeon of Duisburg for accident.

Those cases that demand excision from displacement, the result of injury, must be carefully distinguished from cases of apparent dislocation, the result of hysterical contraction. In the latter class of cases, from the continual contraction of the muscles, the bone becomes much more prominent, owing to the laxity of the ligaments produced by constant

tension. Mistakes of this kind can be easily obviated by observing the conditions of the parts during sleep (considering also the age and sex of the patient) or under the influence of an anæsthetic. An astragalus apparently displaced to such an extent that the patient walked on the external surface of her foot, will probably be recalled to the memory of some here present, in which excision of the astragalus was not only contemplated, but about to be performed, on an hospital patient, when the resident staff observed that during sleep the displacement disappeared. In removal of the astragalus I did not find it necessary to saw the bone at the neck and leave the head articulating with the scaphoid, to be afterwards removed. This procedure is advised by some surgeons, but is unnecessary.

With respect to contraction after Chopart's operation, I may state that experience and dissection have shown that it is not only the tendo-achillis that may be at fault, but the flexor communis, the tibialis posticus, and the long flexor pollicis. Hence the want of success in relieving the contraction by the division of the tendo-achillis. Out of the thirteen mediotarsal operations I have performed, and have records of, I have been fortunate not to have had any contraction. In one case only did I secure the tibialis anticus and peroneus longus to the site of the cicatrix. I doubt not that if the ankle-joint is kept well flexed during the process of cure that no contraction will take place; but to me it seems that the removal of the scaphoid bone plays an important part in the cause of this contraction—an additional reason in favour of those who argue that if the bone of a foot be not diseased or implicated it should not be removed, because it may happen to form the line of a particular operation.

In the last case that I have recorded—the removal of the os calcis, astragalus, and external and internal malleoli

with the articulating surface of the tibia—I find in the *Lancet* of 1848 not altogether a dissimilar case recorded by Mr. Thomas Wakely, entitled “Excision of the Ankle-joint and the entire Removal of the Astragalus and Os Calcis.” His incisions, however, are most complicated, and he removed a flap from the sole of the foot situated between two of the incisions made for the purpose of forming his flaps. The posterior tibial artery was cut, and the anterior tibial vessel narrowly escaped. The mode of procedure adopted by Mr. Wakely is complicated and unnecessary.

Heyfelder reports removal of the os calcis and astragalus in 1858 by a much less complicated method than that of Mr. Wakely—the second case on record. Many examples of advantageous and successful removal of the bones of the tarsus are related by Mr. Holmes in his “System of Surgery;” by Annandale in the *Edinburgh Surgical Journal* and in *St. George’s Hospital Reports*; and one case is recorded in the *Lancet* of 1881, where it is stated that the entire tarsus was removed, no tendons were cut, the periosteum was preserved, and the tissues were replaced by a solid mass.

I am not aware of any successful case of the removal of os calcis and astragalus in Dublin until the one I in 1882 reported.

In conclusion, I hope that I may state that before deciding on any particular operation it will be well to consider in what stage the disease is—whether acute or chronic, progressive or quiet, diffuse or limited. It is in the chronic and non-diffused cases that partial operation is successful; when diffused and in large articulations partial operations are worse than useless. Again, caries following on inflammation of ligaments is much more favourable for partial excisions than when caries commences in the cancelli of the bones. In all cases of disease of the foot

where excision of a particular bone or bones is contemplated an examination by the Roentgen rays is essential.

MR. CROLY said that he was not in favour of excision of the os calcis. A patient with tuberculous os calcis had rarely the disease confined to that spot. If the os calcis were touched at all he approved of its entire removal. The bone could not be entirely removed by gouging, but should be removed in such a way that the incision will not be under the heel, but rather behind it. Excision of the os calcis was a good operation in case of accident. He considered Chopart's operation very good, because if the disease was confined to all the bones in front of the mediotarsal line, a sound astragalus and os calcis were left. Podal coma required amputation of the foot. Nélaton's perforating ulcer of the foot was a rare affection, and was connected with certain forms of neuritis, and sometimes in connection with diabetic condition of urine. Perforating ulcer might be easily overlooked, and was very unfavourable for dealing with.

MR. T. MYLES related a very remarkable case of tuberculosis of the foot. Two years ago a pony tramped on a young lady's foot. A small abscess formed, which was opened, and a small sinus existed. It caused her small inconvenience. Patient had lost a great many teeth. Probing showed some bare bone apparently over the cuboid. An incision was made over the cuboid bone, and the bone dissected out, and the girl apparently got well. At the end of some weeks a tiny sinus still existed, and the girl left for the country. Four months later he saw her in consultation with Mr. Tobin, and from that till two months ago she was operated on repeatedly, bits of bone having to be scraped away. Two months ago a consultation was held, when it was decided to amputate the foot, but from that moment, to his unbounded astonishment, the young lady recovered rapidly, and is now perfectly well and going about. He recently operated on a young man of twenty-eight years of age suffering from metatarsalgia, and under the fourth metatarsal bone he thought there was a corn, which he excised. Microscopical examination proved the corn to be lined by epithelium, and he did not know what the condition was.

MR. R. L. SWAN said that some years ago almost any tuberculous disease of the foot was condemned, generally speaking, to a Syme's

amputation. He considered this an extremely erroneous practice, more especially in tuberculous disease, as it could now be distinguished by the X-rays. He considered that any tuberculous disease of the metatarsal bone at least should not be submitted to any operation except upon the bone itself, and many cases of tuberculous disease were confined to the metatarsal bones. The literature of the subject seemed to show that tubercular disease of the os calcis is in reality the tubercular disease of the foot which can be most frequently attacked with success. He related a case of tubercular disease of the ankle-joint which, after a time, got practically well. Subsequently patient developed tubercular disease of the elbow, and a little later a tubercular abscess in the iliac fossa. The question to decide was if one is right in allowing tubercular disease of the ankle-joint to go to the bitter end, and was dissemination not allowed to occur.

DR. HENRY FITZGIBBON said that in cases of disease of the bones of the foot he approved of minor surgical methods before resorting to amputation. He related a case of a young girl whose middle cuneiform bone he removed for tubercular disease. Recovery good.

MR. CHANCE said the case related by Mr. Myles was very exceptional. He thought that too much attention is given to the mapping out of the bones, as tubercular disease travels pretty much by the tendons and other structures. While he agreed that certain bones which are affected in small part of their bulk should be entirely removed, he thought that excision of such bones rarely gave room for free removal of the soft structures.

SIR F. CRUISE had seen the partial operations done successfully fifty years ago, so that the subject was not at all new. He observed that in a fairly healthy patient complete removal gave a good result, but that if the patient's constitution was decidedly tubercular, even amputation did not save him.

MR. WHEELER, in reply, said that excision of the os calcis was favourable because the synovial sac is limited, thus preventing rapid extension. The sooner the bone is removed the better, and he did not approve of the gouge in removal, because it was difficult to say whether one was in healthy or unhealthy tissue, and, still more, in strumous patients the use of the gouge might set up inflammatory action, which would produce more carious disease. The podal coma he had seen was the same as that described by Miller.

SOME CASES OF PERFORATING GASTRIC ULCER.

By THOMAS MYLES, M.D., F.R.C.S.;

Vice-President of the Royal College of Surgeons;
Surgeon to the Richmond Hospital.

[Read in the Section of Surgery, March 3, 1893.]

IN no branch of abdominal surgery has the departure from old traditions been more pronounced, and in none have the successes been more brilliant than in that to which I shall refer to-night.

So many points of interest spring before one's mind in connection with this subject that there is a difficulty in making a selection, without omitting what may be vitally important. I will first refer briefly to the cases that have come under my notice, and then discuss, necessarily in a very cursory manner, a few of the more important points that are still controversial:—

Some months ago I was asked by my friends, Sir Francis Cruise and Dr. Moran, to see with them a gentleman with the following history:—

Early on that day, when at his office, he had been seized with violent abdominal pain and vomiting. Dr. Moran saw him, and on examination found him suffering from an umbilical hernia—tense, hard and tender. This hernia Dr. Moran reduced, and the patient expressed himself as feeling somewhat relieved. He was then put in a cab and driven home.

Some little time later on the same day the vomiting recommenced, and the patient complained of unendurable pain above the umbilicus in the middle line of abdomen.

Sir Francis Cruise, who had previously treated him for gouty affections, was called into consultation, and during his examination the patient began to vomit black, tarry matter, evidently

blood acted on by the gastric juice. At this stage it was resolved surgical advice should be had, and I was sent for, as detailed above.

I saw the patient at 8 p.m. He was a thin, spare man of ascetic type, aged seventy, with an expression of great suffering in his features. His legs were drawn up; his abdomen, slightly distended, was as rigid as a board; his breathing shallow and hurried. The slightest touch on the abdomen caused great suffering, and on percussion the area of liver dulness was replaced by one of resonance.

At the umbilicus was still felt a decided fulness, as if the hernia had perhaps partially recurred. He had all the aspect of a man rapidly sinking in a state of collapse, and it was evident that if any surgical measures were to be undertaken there was no time for delay. I may add here that though, of course, we all diagnosed perforation of the stomach, we were inclined to attribute it to sloughing of portion of the stomach wall, previously involved in the hernia, rather than to a perforating ulcer of the ordinary type.

The patient's relatives seeing his collapsed condition, and being told frankly that the operation held out no great hopes of saving him, were unwilling to subject him to what seemed useless and additional suffering, and I confess with this feeling I largely sympathised. On laying the case fairly and squarely before the patient, to our great surprise he at once elected to be operated on, saying with both wisdom and resolution that he would rather die at once on the table than prolong his present agony till the inevitable end came.

As the accommodation in his present quarters was totally inadequate for such a grave operation, it was decided to remove him to the Richmond Hospital close by and operate there. This was done, and all preparations being duly completed, ether was administered by our then house surgeon, Dr. Louis Robinson. Dr. Harvey, assistant surgeon to the hospital, assisted me at the operation, which was witnessed by Sir Francis Cruise, Dr. Moran, and the resident staff.

An incision was made in the middle line so as to expose the umbilical hernia; exploration of this showed that the hernia was reduced, but the sac was very thick, and contained some fatty

masses in its outer surface, which gave me the impression that the hernia had partially recurred, or had been incompletely reduced. Coils of intestine now flaked with lymph came into view, and a little later fluid, evidently from within the bowel somewhere, trickled down from above. The wound was, therefore, enlarged upwards, and a very slight search brought the perforation into view. It was in the anterior stomach wall some two inches from pylorus, and was about $\frac{1}{2}$ inch long extending vertically from above down. There was no evidence of any constriction around it to indicate that it had been involved in a hernia, so this hypothesis had to be abandoned. Further examination showed a good deal of thickness and hardness about the pylorus, and I at once suspected the possibility of malignant disease. A probe was passed into the opening and thence through the pylorus. It undoubtedly gave me the impression that the case was complicated by a pyloric stricture, and I at once proposed to establish a gastro-jejunal anastomosis. Sir Francis Cruise, however, in answer to my inquiry as to the patient's strength being sufficient to stand this additional procedure, informed me that if the operation was not promptly completed the patient would die on the table. I resolved, therefore, to close the wound in the stomach, and postponed any further measures until the patient had rallied. The edges of the little wound were, therefore, carefully resected, and closed with a double row of silk sutures, the first continuous, the second interrupted. As the patient was now practically pulseless and very cold, thorough cleansing of the peritoneum was impossible, and it was resolved to douche the abdominal cavity with a hot saline solution. This was done while the sutures were being passed in the abdominal wall, and had a very stimulating effect, the patient at once rallying. A small gauze drain was carried down to the line of sutures in stomach, as it was felt that the rapidity with which the operation details had been carried out prevented us placing absolute confidence in the completeness and permanence of the suturing. The patient having been carried back to bed, vigorous methods were adopted to rouse his dormant energies. His limbs were completely enveloped in cotton wool, hot blankets were wrapped around him, hypodermics of strychnine and atropine, and rectal injections were administered, the end of the bed raised about a foot above the level of the head,

to encourage the central blood supply, and hot saline solutions with a transfusion outfit were kept handy, to be available in case of emergency.

For several hours he hovered between life and death, but gradually his latent energy began to manifest itself, the pulse at the wrist again became perceptible, the sufferer became warmer, and he gradually recovered consciousness. From that moment until the fourteenth day he never looked back. Nursed with the most assiduous care under the directions of Miss M'Donnell, our Lady Superintendent, he recovered with a rapidity that I have never seen equalled by one of his age before. On the fourteenth day, when I visited him, a serious change had taken place. He was cold and blanched, pulse very rapid and fluttering, breathing hurried, complained of great thirst, and said he felt himself dying. Inquiry elicited the fact that during the act of defæcation copious hæmorrhage had taken place from the bowels, and two pans filled with fluid blood bore testimony to the statement. While speaking to him he complained of again wanting to stool, and then and there he passed another painful of blood. Needless to say, this was a terrible blow to us; just as we had piloted him, as we thought, through all his dangers, was his barque foundering within sight of land! A hurried consultation with my friends, Sir Francis Cruise and Dr. Moran, was held, and though it was obvious that to administer an anæsthetic and thoroughly explore the rectum was out of the question, we thought it might be possible without undue shock to find the bleeding spot and control it.

A large soap and water enema was given at once, the rectum well emptied, and then just inside the anal margin a ring of swollen, deeply congested piles were seen. A little cocain solution was swabbed over them, and then a tampon of cotton wool soaked in Friar's balsam was inserted and kept in place with a pad and bandage.

This had the desired effect; no more bleeding occurred, and though convalescence was seriously retarded by this untoward complication, the patient some six weeks after the operation was driven in a pneumatic-tyred carriage to Kingstown, where the fresh air and sea breezes soon restored him to his pristine vigour. He is now, I am glad to say, back again at his business as a director of one of the largest commercial enterprises in the city.

I have given the details of this case at some length, partly because it was by far the most interesting of all those I have met, but also because it was the most recent, and, therefore, the impressions derived from it were the strongest. The total number of cases I have operated on up to the present, in which the diagnosis of perforating gastric ulcer was made before and verified at the operation, is four.

Of these, three occurred in females, and one in a male. Of the three in women two died, one some twelve hours after the operation, and the other exhausted by prolonged suppuration and leakage through a gastric fistula.

A few brief notes of these I will lay before the meeting:—

Mary A., aged nineteen, a servant in the Young Women's Christian Association, Harcourt-street, was attacked suddenly with violent abdominal pain, vomiting, and collapse; no hæmorrhage. Called to see her, I at once diagnosed perforation, and had her removed to the Richmond Hospital. She was seen by my colleagues in consultation, and an operation urged upon her. This she declined. Two days later she was much better, and felt convinced she had been wiser than her medical advisers. She was seen from time to time by my colleagues, and complained only of a feeling of fullness in the epigastric area, and some tenderness on pressure. She was living on a fluid diet, and had no vomiting. Some six weeks after her admission to hospital she suddenly developed acute pain in the abdomen, a swelling formed in the left side of epigastrium, dull on percussion, with œdema of skin over it. It was obvious an abscess was forming. At the urgent solicitation of her friends she consented to the abscess being opened, but no further operation was to be attempted. As a matter of fact nothing else could be done. A large abscess was evacuated, but the thick layer of lymph which covered everything made it impossible to recognise any of the viscera, or to find the opening of the stomach.

The cavity was douched out and drained, and for a time we hoped she would recover, but she gradually sank and died of exhaustion.

Had this girl consented to the operation proposed within

a few hours of the onset of her illness, in all probability her life would have been saved.

The other two cases may be dealt with briefly. One was a woman, aged about thirty, in whom perforation had taken place some days before admission to hospital. She was emaciated to an extreme degree, and a large collection of fluid could be easily recognised in the abdomen. In cutting into this quantities of half digested potatoes and the liquid contents of the stomach were discovered, but she never rallied, and died very soon after the operation.

The fourth case was most interesting.

Patient, a married lady, aged thirty-two, was seized with violent pains in the abdomen, vomiting and collapse; no bleeding. When I saw her the collapse was so pronounced that operation was out of the question. Heat was applied to the epigastrium, rectal injections of alcohol, and a small hypodermic of morphia given later. Twenty-four hours later pain had subsided, but there was one spot very tender, exactly in the middle line. Operation proposed and declined, patient alleging, with a certain amount of justification for her belief, that she felt certain she would die on the table. Five days later a small abscess had formed. This was explored with a hypodermic syringe, and the diagnosis being thus verified, local anæsthesia was produced with the ether spray, and the abscess opened with a tenotome. About an ounce or so of thick pus evacuated and a small drainage tube inserted. Though I naturally gave a very unfavourable prognosis, the patient recovered rapidly, and is alive and well to-day.

So far for the cases in which the diagnosis of perforation was made and verified by operation.

But, in common with all surgeons of any experience, I have diagnosed perforation of the stomach which did not exist. In one case in which I was mistaken, a remarkably accurate diagnosis had been made by a much younger man, Dr. Grandy, at one time house surgeon at the Mater Hospital. He sent a patient into the Richmond Hospital in

whom he had diagnosed perforation of the bile duct, but which I confess I believed to be a perforation of the stomach. Laparotomy was performed. A biliary abscess was opened and drained, but it was found impossible to discover the seat of perforation. The patient gradually sank and died of exhaustion. The autopsy was made by my friend Dr. Woods, who discovered a perforation of the cystic duct.

In another case in which perforation of the stomach was diagnosed, I found that organ apparently perfectly healthy, and nothing but a localised collection of peritoneal fluid.

My friend, Dr. Chance, some time ago operated on a similar case, in which also nothing abnormal could be discovered.

Quite recently Dr. Conway Dwyer exhibited at another scientific gathering a patient on whom he had operated for perforation of the stomach, but exploration showed that the lesion was an acute strangulation of a coil of the jejunum, which he resected with the most brilliant success. I mention these cases because in these, as in all other abdominal cases, the liability to error in diagnosis is ever present. It is because of this inherent weakness in the power of diagnosis that one is compelled to question the accuracy of the statement so often made at the last meeting of the British Medical Association that recovery frequently takes place spontaneously after perforation.

I confess myself unable to accept such a result as probable, or even possible, except in a very minute proportion of cases.

Should a perforation occur, of the pinhole type, in an absolutely empty stomach, no extravasation of the contents need take place, and the little opening may soon be shut off by exudation.

The experience of physicians, pathologists, and operators is entirely opposed to the belief in the frequency of such a

fortunate combination of circumstances. In this connection, Hume's theory of miracles seems to be applicable.

Is it not more probable that the diagnosis was erroneous than that phenomena opposed to all pathological experience have occurred? Forgive me if I appear to labour this point, but it is vital and essential.

If spontaneous recovery is at all within the limits of probability, operation might very well be at least delayed. I venture to say, however, that very few men, even of those with the most profound belief in the efficacy of drugs and the powers of human resistance, would take the responsibility on themselves of recommending a patient in a case of supposed perforation not to submit to operation, but to trust to the *vis medicatrix naturæ*. Surgical experience, now fairly extensive in this subject, has shown that the earlier the operation is undertaken, other factors being appropriate, the better the chance of success.

If the abdomen is opened before exudation of lymph has taken place, the opening is generally easily found. If twenty-four hours have elapsed in an average patient, the matting together of all the organs, and their envelopment in a thick layer of lymph, renders it practically impossible. In such a case death from exhaustion is almost, though not absolutely, inevitable.

Again, in approaching a case of perforation the surgeon must remember that the operation may be very easy or very difficult. If the opening is in front and the operation is promptly undertaken the work will not be difficult. If the opening is behind, or the operation delayed, it may tax all the surgeon's resources and end in failure and disappointment. Two points in the technique I would like to refer to—1st. The use of the douche, and 2ndly, the use of a drain. It is urged against the use of the douche that it may convey infecting particles to areas as yet uninfected,

and thus prove the cause of a general septic peritonitis. *Per contra*, it is urged that no amount of mopping can ever completely cleanse the peritoneum, and Mr. Treves quite recently has drawn attention to the fatal injury that may be done to its smooth, glossy and absorbent surface by violence applied to it under a mistaken idea of its function and limitations.

I must confess I am rather against the mopping plan, and favour the thorough douching. If the nozzle of the douche is carried low down into the pelvis first, and later into the flanks, the stream of warm water rushing out through the wound under pressure will carry practically everything with it. It may be necessary here and there to assist this process by wiping away all adherent particles, but it is only the stomach contents that need to be wiped away, the lymph exudation may well be left alone unless there is reason to believe that it is already a centre of decomposition and infection.

Lastly, I believe these cases ought to be drained until the temperature is normal, and until the seat of perforation is shut off from the general cavity of the peritoneum. The tissues around the seat of ulceration are generally unhealthy, and even the most expert operator may have his doubts as to the durability of his suturing under such circumstances.

I fear I can hardly claim to have laid anything new before you, but the subject though not novel is not without interest; it deals with a fairly common condition, and therefore appeals to physicians and surgeons alike.

When we remember that even 20 years ago such operations as those I have outlined to you, if suggested by an operator, would have been regarded as the dream of a lunatic, one cannot help feeling both proud and hopeful of our art.

The modern operation of laparotomy, simple as it seems to-day, has only reached its present position through the combined labours, trials, experiments, and disappointments

of the greatest minds of our age. Though it is not given to all of us to be originators of great ideas we can, all alike, at least help in the good work by repeating and verifying the work done by the pioneers of science, and so contribute even an imperceptible mite to that beneficent knowledge which our profession, to its credit be it said, has ever held to be the common heritage of humanity.

SIR F. CRUISE bore out all Mr. Myles said in his paper. He had learnt from the case *nil desperandum*. The patient was almost pulseless at the commencement of the administration of the chloroform; the pulse became much better when the chloroform was changed to ether. The result of the operation was most extraordinary.

MR. WHEELER congratulated Mr. Myles on the excellent result, which showed that early operation offers better chances of recovery than delayed operation. He preferred swabbing out the abdomen to douching. He had seen saline solution revive a patient on whom he operated for tubercular peritonitis. It depended on the position of the perforation of the stomach whether the operation could be rapidly done or done at all.

MR. CHANCE mentioned the case of a young woman with gastric ulcer who suddenly became collapsed with symptoms of perforation. Laparotomy was at once performed, but thorough examination of the stomach revealed nothing. The abdomen was closed, and recovery followed. In another case, that of a woman, he opened the abdominal cavity, and found in an abscess a small cavity, a good deal of flocculent material, and a considerable quantity of undigested food. He drained the abscess, and recovery followed. The mortality of stomach operations seemed very high according to statistics, because the operation was done for malignant disease.

MR. MYLES replied.

HEY'S INTERNAL DERANGEMENT OF THE KNEE-JOINT.

BY JOHN KNOTT, M.A., M.D., CH.B., & DIP. STAT. MED. (UNIV. DUB.); M.R.C.P.I.; M.R.I.A., &c.

[Read in the Section of Surgery, April 7, 1899.]

IN the volume of "Practical Observations in Surgery," published early in this century by Mr. Hey, of Leeds, is included a paper "On Internal Derangement of the Knee-Joint," which contains the original description of the very peculiar lesion to which the name of this distinguished surgeon has since been attached. It is given in the following words:—"This joint is not unfrequently attended with an internal derangement of its component parts, and that sometimes in consequence of trifling accidents. The disease is, indeed, now and then removed, as suddenly as it is produced, by the natural motions of the joint without surgical assistance; but it may remain for weeks or months, and will then become a serious misfortune, as it causes a considerable degree of lameness. . . . This disorder may happen with or without contusion. In the former the symptoms are equivocal till the effects of the contusion are removed. When no contusion has happened, or the effects of it are removed, the joint, with respect to its shape, appears to be uninjured. If there is any difference from its usual appearance, it is that the ligament of the patella appears more relaxed than in the sound limb. The leg is readily bent or extended by the hands of the surgeon, and without pain to the patient; at most the degree of uneasiness caused by this flexion or extension is trifling. But the patient himself cannot freely bend nor

perfectly extend the limb in walking; he is compelled to walk with an invariable and small degree of flexion. Though the patient is obliged to keep the leg thus stiff in walking, yet in sitting down the affected joint will move like the other.

"The complaint which I have described may be brought on, I apprehend, by any such alteration in the state of the joint as will prevent the condyles of the os femoris from moving truly in the hollow formed by the semilunar cartilages and articular depressions of the tibia. An unequal tension of the lateral or cross ligaments of the joint, or some slight derangement of the semilunar cartilages may probably be sufficient to bring on the complaint. When the disorder is the effect of contusion, it is most likely that the lateral ligament on one side of the joint may be rendered somewhat more rigid than usual, and hereby prevent that equable motion of the condyles of the os femoris which is necessary for walking with firmness."

Such are the words of the earliest notice of this peculiar lesion which we possess, and such is the uncertainty as to the accurate diagnosis in which the original describer has left his readers, and, so far as we can see, was obliged to remain himself.

Sir Benjamin Brodie notices Hey's observations, and says that "the symptoms very much resemble those produced by a loose cartilage within the joint," but his views of the actual nature of the existing condition seem even more indefinite than those of the latter writer; and he states further on, in reference to a case which had occurred in his own practice, that "the facts which I am about to state are not very easy to be reconciled, either with this hypothesis or with that suggested by Mr. Hey."

When a very junior surgeon I ventured to publish my views on this obscure affection. They were based upon per-

sonal experience of symptoms and signs, and on careful anatomical investigation. The lapse of time has but served to confirm them; and, as they do not seem to have indoctrinated the present generation of surgical authorities so completely as I could have wished, I have determined to submit them once more to the examination of my professional brethren. Many, at least, of the surgical apostles of the present day appear to have made up their minds to a very decided view of the actual state of things in Hey's internal derangement of the knee-joint; and, without much more conclusive evidence to go upon than that which was then possessed by the distinguished surgeons whose names I have mentioned, unhesitatingly inform their readers or hearers, as the case may be, that the symptoms are due to a luxation of one of the semilunar fibro-cartilages which are interposed between the cartilaginous surfaces in the femoro-tibial articulation.

Before proceeding further with my subject, I will mention that I understand by the term "*Hey's Internal Derangement of the Knee-Joint*," *an abnormal condition suddenly resulting from the application of external violence, and as suddenly reducible by appropriate manipulation.*

In the tenth edition of "Erichsen's Surgery," edited by Messrs. Marcus Beck and Raymond Johnson, will be found the words of this high authority thus written:—

"*Subluxation of the Knee, Displacement of a Semilunar Cartilage*, or, as it was termed by Hey, internal derangement of the knee-joint, is a common and very troublesome accident. It usually occurs whilst the knee is slightly flexed and the leg rotated inwards or outwards." Instances of the causation are given:—"Rising from a kneeling position, or kicking a football (the limb affected being that upon which the patient is standing), or by striking the toe against a stone in walking." . . .

"In many cases a distinct fulness can be recognised on

one side of the ligamentum patellæ in the hollow between the tibia and the femur, and there is tenderness at the same spot. In the course of a short time, in most cases, the joint becomes distended by inflammatory effusion.

"This accident has been the subject of much investigation since it was first described by Hey. It has long been recognised that it is due to a displacement of one of the semilunar cartilages."

In the "System of Surgery," edited by Mr. Treves, p. 1015 of Vol. I. has the running title of "Displacement of Semilunar Cartilage," calling attention to a section the opening of which on this page bears the title "Subluxation of the Knee, Internal Derangement of the Knee, Dislocation of the Semilunar Cartilage." The writer (Mr. A. Marmaduke Shields) proceeds to inform us that: "Under this heading is described a peculiar condition of the knee-joint, which almost invariably is associated with a wrench, sprain or other injury, and which is characterised by a sudden sensation of the joint being 'put out;' some fixation and impediment to the movements of the limb, more or less pain, and, lastly, by the functions of the articulation being suddenly and properly restored by an appropriate manipulation.

"Causation and Pathology.—The accident is usually produced by a twist of the leg, when the knee-joint is flexed and the tibia is fixed, the body and femur being suddenly rotated on the tibia. . . . swinging the body to make a stroke at golf, or in the rotation which occurs in stepping out of a dogcart (Treves.) . . . In practice, the internal cartilage will be found to be most generally displaced. This occurs in violent external rotation, principally performed by the biceps. . . . The gap between the internal condyle and the tibia is, however, increased, and the movable internal cartilage is apt to slip between the internal condyle and the inner tuberosity of the tibia. . . . Godlee has

argued from anatomical considerations that the external cartilage is more frequently displaced. Clinical experience points, however, undoubtedly to the greater frequency of the displacement of the internal cartilage."

When a student engaged in preparing for my first surgical examination, it was considered very necessary for every candidate to know the special views of one member of the board before which we unfledged aspirants were obliged to present ourselves. His explanation of the greater frequency of "derangement" of the internal cartilage was its intimate adhesion to the corresponding lateral ligament, by which it was dragged out of its position when the leg was wrenched outward with sufficient force. How the cartilage in question could be so dragged out of the joint, without having its cornual attachments torn, remained the *meta*-physical part of the problem.

Mr. Herbert W. Allingham, in his exhaustive monograph on "Internal Derangements of the Knee-joint," gives the following account of displacement of the semilunar fibro-cartilages:—

"When rotation *outwards* takes place, the gap between the internal condyle of the femur and the head of the tibia will be found to be increased; and the internal semilunar cartilage is more movable, and consequently is apt to slip too far in between the condyle of the femur and the corresponding head of the tibia.

"A parallel state of affairs results when the tibia is rotated *inwards*, for then the gap between the external femoral condyle and the head of the tibia is increased, and then the external cartilage is more movable.

"When the knee is flexed, the anterior part of the internal semilunar cartilage glides backwards on the head of the tibia; if the leg be then rotated outwards, the internal semilunar cartilage will be drawn in between the internal

condyle of the femur and the head of the tibia. Sudden movement or extension will then cause the internal condyle to roll on to too much of the internal semilunar cartilage. Now, as extension is always combined with external rotation of the tibia, the inner tuberosities of the latter must make a sweeping movement forwards and outwards. The internal cartilage will be held by the femoral condyle, and as the tibia makes its curve forwards and outwards the coronary ligaments will be stretched, or even torn. This, doubtless, is what occurs in aggravated cases, and when the accident has recurred frequently. The converse applies to displacements of the external semilunar cartilage. In the milder forms there may be only a stretching and relaxed condition of the coronary ligaments, but when once thus relaxed they are always in danger of being further stretched or even ruptured.

"There are some conditions which predispose to these derangements.

"A lax condition of the ligaments about the joint caused by general debility or previous synovitis, predisposes to these accidents on account of the insecure way in which the femur and tibia are then bound together. Prolonged flexion of the knee-joint, as in kneeling, strains the anterior part of the coronary ligaments, and renders possible a liability to these disorders."

Our courteous secretary, Mr. John Lentaigue, called my attention to the October issue of the *Annals of Surgery*, in which there is an elaborate paper on the "Cause and Treatment of the Subluxation of the Semilunar Cartilages of the Knee-Joint," by Newton M. Shaffer, M.D., in which the author believes that he has established the following "facts":—

"(1) In many cases of Hey's joint there is an acquired or, perhaps, congenital lateral mobility of the knee-joint. This

condition existing, the normal rotation of the tibia in flexion or extension of the knee is greatly increased.

“(2) In many cases, if not in all cases, there exists an elongated ligamentum patellæ, which so modifies the action of the quadriceps extensor muscle upon the tibia that the force of its contraction upon the tibia is modified or delayed in such a way that extension and rotation are not synchronously performed. And it seems more than probable that this condition forms an important factor in the production of the subluxation of the semilunar cartilage.”

And again, the writer quotes Allingham's statements: “The injury is caused by some sudden and almost involuntary movement. Most of the muscles governing the joint are then thrown off their guard, or fail to act in concert one with the other.”

Dr. Shaffer then proceeds to say: “But I do not agree with Mr. Allingham when he says ‘All this may occur even in a healthy joint,’ if for healthy we substitute ‘normal,’ except under circumstances where great lateral pressure is applied, and when a true subluxation of the tibia occurs as a result of direct violence. In these cases there existed a condition which I have attempted to describe, and which directly favoured the subluxation. And further, the muscles are not ‘off their guard.’ The quadriceps acts promptly; but the patella, instead of clamping the femur with a normal length of ligament in the trochlea, is tilted upward at the lower end, and the muscular effort is so delayed that the movable semilunar cartilage is caught, perhaps only slightly pinched, or really dislocated, and sometimes seriously damaged.”

In nearly all the above quoted descriptions of this lesion there appears to be a tacit assumption that one of the semilunar fibro-cartilages has been displaced. Too intimately associated with this unproved assumption is a positively

inexplicable haziness in the minds of the respective writers regarding the actual structure of the knee-joint.

To examine the validity of the grounds for such a conclusion is my chief object in making this communication. To do so satisfactorily it will be necessary to call attention to some of the more prominent features in the mechanism of the knee-joint, and to notice more especially the connections of the fibro-cartilages, which concern us so intimately in this lesion.

The upper end of the tibia presents an extensive surface, bearing two articular facets separated by a rough non-cartilaginous interval, which runs in an antero-posterior direction, and is chiefly destined for ligamentous attachment. Of these facets, the internal is the larger and of somewhat oval shape, with the long axis passing from before backwards; it is also somewhat more hollow than the other, although the amount of depression on either side is but slight, and, in the recent state, is still further diminished by the greater thickness of the articular cartilage in the central part. The outer facet approaches the circular form.

The inferior extremity of the femur presents two articular facets which are, respectively, more extensive than the corresponding ones on the head of the tibia on which they rest. The deep intercondyloid notch separates the two condyles, of which the internal is prolonged downwards considerably further than the external—a disposition of parts which determines the internal obliquity of the shaft of the femur, and the formation of an angle salient inwards at the inner aspect of the knee-joint.

It is obvious that the very shallow depressions on the upper end of the tibia can afford no security for the condyles of the femur during the various movements of the joint. The glenoid cavities for the reception of these articular prominences are, accordingly, almost solely formed by the semi-

lunar cartilages. Each of the latter structures presents three surfaces—a superior, which is markedly concave; an inferior, nearly flat; and an external, forming the prominent rim, which is connected with the fibrous structures surrounding the joint. This rim, in a well-formed adult knee, is of considerable thickness.

At the inner (concave) side the cartilage thins down to an irregularly festooned edge. On examination of the mutual relation of these fibro-cartilages, we find that the external forms almost a complete circle, while the internal forms a C-shaped curve, elongated from before backwards, and of which the extremities embrace those of the outer cartilage. These extremities (*cornua*) are extremely strong, and bind the cartilages with great firmness to the non-articular portions of the osseous surface, while the circumferential aspects of the cartilages are bound—rather loosely—to the corresponding margins of the head of the tibia, by the so-called “*coronary*” ligaments. The other surfaces are covered with synovial membrane, and glide smoothly—the upper on the cartilaginous surface of the corresponding femoral condyle, the lower on the head of the tibia. “The fore part of each is less fixed than the hinder, so that it may be free to follow up the condyles as the latter recede from the front of the tibia in flexion, and be pressed back again into its place in extension” (Humphry). In the case of the external cartilage, the posterior cornu has an accessory attachment to the femur, which accompanies the posterior crucial ligament (*cornu postici adhesio primo* of Weitbrecht, *ligamentum cruciatum tertium* of Robert). This femoral adhesion causes the cartilage to follow, to a limited extent, the movements of the lower end of the thigh bone; and its nearly circular outline, with the greater looseness of its coronary attachments, and the fact that it does not, like the internal semilunar fibro-cartilage, adhere intimately to the corresponding

lateral ligament of the joint, all combine to give to the external of these cartilages a greater degree of mobility than is permitted to the internal.

The more obvious movements of the knee-joint are those of flexion and extension—characteristic of the ginglymus articulation, of which it forms an imperfect type. In addition to these, the knee possesses, when moderately flexed, a rotatory movement, which, as shown by the brothers Weber, may attain a range of 39° in the normal joint. The vertical axis around which these movements take place passes through the head of the tibia, at the inner side of the spine. The use of the greater mobility of the outer cartilage is obvious in this connection; for if it were absolutely fixed to the head of the tibia, any considerable rotatory movement of the latter bone would inevitably throw the external femoral condyle out of its articular cavity. Slight lateral movements of the *passive* variety may also be demonstrated in the knee-joint when the leg is semi-flexed. In this position, the ligaments being relaxed, external pressure will produce movement of the tibia to either side; the latter bone gliding, to a very limited extent of course, upon the articular facets of the femoral condyles.

With regard to the more ordinary movements of the knee, an interesting anatomical fact has been demonstrated by Tillaux. This anatomist pointed out that a vertical antero-posterior section through one of the condyles is not limited at the lower end by an arc of a circle, as formerly represented: the cartilaginous surface represents two arcs—one anterior and the other posterior—belonging to circles of different radii, and separated by a portion of a very flattened ellipse. The mechanical result of this arrangement is that in flexion of the knee there is, at first, rotation round an anterior axis; towards the middle of the movement, a combination of rotation and gliding; which is, in turn,

replaced by a purely rotatory movement towards the end of the act of flexion. The axis, around which the movements of flexion and extension take place, passes through the femoral condyles at the level of the attachment of the lateral ligaments of the joint.

An even moderately careful scrutiny of the recorded observations of "internal derangement of the knee-joint" will show that the writers on this subject have included, under the same denomination, two distinct varieties of surgical lesion; one in which the displacement is supposed to have affected the semilunar cartilage only, and another in which, besides the "derangement" of the cartilage there is also a change established in the normal relations of the articular surfaces of the femur and tibia; or, in other words, an incomplete dislocation of the leg.

Some cases of the former class would appear to have been unaccompanied by prominences or any other outward and visible sign of the existing internal derangement. This would seem to have been pretty much the case in some of the instances observed by Hey himself. A good case of the typical "internal derangement" has been recorded by Bonnet (de Lyon): "A very active man, aged 45, twisted his knee in making a movement of external rotation. I saw him two days after the accident; no physical derangement could be detected in the knee; there was merely a small amount of serous effusion into the synovial cavity. The patient could walk only with extreme pain; he suffered much, and could extend his leg upon the thigh but in a very incomplete manner. This disproportion between the impairment of motion, which was carried to an extreme degree, and the inflammation, which was but slight, made me think that a luxation of the semilunar cartilage had probably taken place. I then flexed the knee as much as possible: this flexion was painful. Having done this a first time, I

extended the leg and flexed again. This manœuvre was followed by immediate relief; the patient was able to walk with less pain, and to extend the leg upon the thigh completely. The inflammation rapidly subsided."

Very valuable evidence with regard to the nature and mechanism of this lesion was obtained by the same surgeon from the results of experiments performed on the dead body. On the cadaver of an adult male who had succumbed to a chronic malady, Bonnet found that by flexing the leg so as to form a right angle with the thigh, as the body lay in the prone position, and suddenly rotating the foot outwards, a peculiar snap was felt, after which the limb remained in the position of external rotation, with the leg flexed upon the thigh at an angle of about 45 degs. At the antero-internal aspect of the knee-joint a prominence could be felt corresponding to the inner tuberosity of the tibia; this prominence projected in front of the inner condyle of the femur; the condyle of the femur was carried backwards and inwards. The rotation of the leg, measured by the deviation of the foot, amounted to nearly a quarter of a circle. Upon extending the leg (for which a slight effort was found necessary) the snapping sensation was again felt, and the normal relation of the articular surfaces was re-established. Subsequent dissection of the knee showed no displacement of the inter-articular structures, and no appreciable laceration of either ligaments or muscles. In the next experiment he removed the patella; and, repeating the movements already described, he watched the effect on the inter-articular structures. The snapping sensation was then found to be produced by the passage of the inner condyle of the femur behind the semilunar cartilage; which was accordingly pushed forwards on the internal glenoid cavity of the tibia, but without any laceration of the internal lateral or capsular ligament of the joint. On the outer side,

the condyle had undergone no considerable displacement; it was carried a little forwards from its normal position, but still lay in the glenoid cavity formed by the external semilunar cartilage. On extension of the limb, with a little effort, this peculiar disarrangement was at once rectified. The experiment was frequently repeated, and always with similar results.

Cases have been observed in the living body which correspond very closely indeed with the facts above recorded as observed by Bonnet on the cadaver. But none of these "derangements" can properly be regarded as a luxation of the semilunar cartilage; they are incomplete rotatory dislocations of the leg itself.

The possibility of such a displacement cannot be doubted by those who are familiar with the normal internal arrangement of the structures of the knee-joint, and the author of the present communication can add to the evidence already published on this subject a description of the accident as it has repeatedly occurred in his own person.

With regard to the other form of displacement, in which the semilunar cartilage alone is said to alter its position without the application of extreme violence, or the co-existence of extensive laceration of the other fibrous structures which enter into the formation of the joint, I look upon its occurrence in the normal anatomical state of the parts as a physical impossibility. Any anatomist who has taken the trouble to test the strength of the cornua which fix the cartilages to the head of the tibia, not to mention the accessory fastenings, afforded by the coronary, jugal, and tertiary crucial bands, and the adhesions to the capsular (and internal lateral) ligament, will have, I think, but small faith in the evidence of a displacement engaging a semilunar cartilage only, and produced by a comparatively slight amount of external violence.

In many of these cases the history corresponds pretty closely to the following type:—A slight amount of violence is applied to the foot on its inner side, when the knee-joint is flexed: the ligaments and muscles about the knee—in the relaxed condition which corresponds to this posture—are, as it were, thrown more or less completely off their guard. A sudden acute pain is at once felt in the joint at the inner side, and the patient is unable to move the leg, which remains in a slightly flexed position, with a certain amount of abduction and external rotation. Sir Astley Cooper, whose description of the ætiology of this lesion corresponds more closely with my experience than that of any writer whom I have had an opportunity of consulting on the subject, has observed it to occur most frequently when a person in walking strikes his toe, the foot being at the same time everted, against any projecting body, such as the fold of a carpet. He also met with a case of the accident in a person who had suddenly turned in bed, when the bed-clothes not allowing the foot to turn with the body, the condyles of the thigh bone were believed to slip from the articular cavities formed by the semilunar fibro-cartilages.

Very few autopsies have, so far as I have been able to ascertain, demonstrated the actual displacement of the semilunar fibro-cartilages of the knee-joint. A specimen was described by Professor Thane in which the external cartilage was found displaced in a dissecting-room specimen. Beid noted a case in which he had discovered (accidentally) in a dead body that the anterior segment of the external cartilage was detached from the tibia, and displaced backwards and inwards. This portion appeared flattened and widened, as if the displacement were of old standing. No history could, however, be obtained.

Verneuil has seen most of the cases of supposed luxation of the fibro-cartilages occur in rheumatic subjects, and would

explain the symptoms present by the changes within the joint produced by this disease. He mentions a case in which he took the opportunity of carefully examining the movements of the joint in a highly emaciated patient whom he was treating for some other condition. In this individual, extreme flexion of the knee caused a prominence to form on the outer side, corresponding in position and form to the outer margin of the external semilunar fibro-cartilage. Palpation gave, at the same time, a sensation of crepitation, and the patient felt some pain in the corresponding part of the joint. He observes, in conclusion:—"I believe that in my case no luxation of the fibro-cartilage took place, for the mobility of this cartilage is a normal condition. Accordingly a new element must be added, which I believe to be synovitis."

It is observed by Panas (*Dict. de Méd. et de Chir. Prat.*) that all the cases of luxation of the semilunar cartilages belong to a period when the occurrence of loose cartilages in the interior of joints, and also the existence of arthritis deformans, had still remained unknown pathological facts; and he professes to believe that all the recorded examples of internal derangement of the knee-joint were but misunderstood cases of one or other of these conditions. In this hypothesis he merely corroborates the views that had already been enunciated by Velpeau and by Malgaigne. The latter eminent authority also points out that in the cases in which (as in those recorded by Bassius and Dequevauviller) an abnormal projection was present, and supposed to correspond to the margin of the displaced cartilage, it was found on more careful inquiry that this projection had existed before the occurrence of the injury. In a case observed by himself the projection had existed in a healthy limb, although to a somewhat less degree.

The fact that "internal derangement" may be confounded

with a floating body within the joint was demonstrated in a case reported by Gimelle. This surgeon detailed to the Académie de Médecine (*apropos* of an observation of luxation of the cartilages communicated by Londe) an account of a similar case which he had himself met with, and in which a corresponding diagnosis had been made. The supposed luxation recurred frequently, and the repeated trouble led at length to a more careful examination, disclosing the existence of a foreign body, which was afterwards extracted by Larrey.

The most probable cases of luxation of the semilunar fibro-cartilages that have been recorded are, perhaps, those of Lannelongue and Le Fort (communicated to the Société de Chirurgie in 1879). The former was that of a girl, aged eleven, who had previously enjoyed good health, and did not appear to suffer from any form of arthritic diathesis. Ten months before entering hospital she had suddenly, while walking with her mother, and without any appreciable cause, experienced a sensation of crackling in the knee-joint. It was not accompanied by any sensation of pain, nor was progression at all impeded. The articular crepitus continued, and accompanied every movement of the joint. Two months later walking became impeded; but it was not till eight months had elapsed after the original injury that pain was complained of, when it became so acute on any movement of the limb as to render walking nearly impossible. Examination of the joint when at rest gave merely negative results; nothing abnormal could be discovered by sight or touch; there was no displacement and no pain on pressure. When the extended limb was gradually flexed, a crackling sound was perceived as soon as the flexion had attained an angle of about 20 degrees; and, at the same time, a projection formed on the outer aspect of the joint which could be seen and felt. When the

limb was brought gradually back to the state of extension from the position of right-angled flexion, as soon as it had passed through an angle of 20 degrees in this direction, another *bruit* was heard louder than the first, with increased prominence of the tumour, after which complete extension (with subsidence of the swelling) followed without further opposition. The evidence of the hand and ear demonstrated that the bruit and the prominence corresponded to the interval between the outer condyle of the femur and the glenoid cavity of the tibia; while the displacement obvious to the eye on the outer side of the joint apparently implicated the external semilunar cartilage. This prominence formed a transverse ridge occupying the line of the articulation in the depression on the outer side of the ligamentum patellæ; it was best marked in front, and gradually lost when traced backwards. When the finger was placed on the skin just before the formation of the swelling, it was found to be suddenly elevated with a peculiar vibratory sensation, which conveyed the idea of an elastic band. It was compared by Lannelongue to the elevation of the skin produced by the pulsation of a large artery. After the formation of the swelling it remained till the second bruit indicated the reduction of the displacement. On the inner side of the joint all was normal. The reduction only was accompanied by marked pain. In this case Lannelongue considers that the only explanation of the phenomena which can be offered is that afforded by admitting the existence of a subluxation of the external semilunar fibro-cartilage. There was no evidence whatever of arthritis deformans; and he believes that the idea of a foreign body is out of the question, as the latter could not always persist in reproducing an identical deformity.

The case of Le Fort possesses a special interest, as it occurred in his own person. The original cause of the

accident, as the sufferer himself observes, presents but few poetic details. This eminent surgeon happened to be in occupation of a position similar to that which the author of "Gulliver's Travels" leads his readers to infer was assumed by his hero after modestly retiring between two leaves of Brobdignagian sorrel. On this occasion the professor, while resting on his feet, with both hip and knee-joints strongly flexed, suddenly experienced a distinct sensation of displacement in the outer part of the right knee-joint. When he raised himself from this posture the knee remained flexed, but a powerful effort restored it to the extended position. This effort was accompanied by acute pain, and a loud crackling sensation, as if some displaced object had suddenly returned to its place. All pain instantly disappeared, and freedom of movement was completely restored. The lesion subsequently reappeared on almost every occasion on which the knee was forcibly flexed, so that this movement had to be studiously avoided.

The above cases afford the strongest circumstantial evidence which I have been able to find of subluxation of a semilunar fibro-cartilage from slight or indirect violence.

An interesting case of injury to the knee-joint was communicated to the Pathological Society of Dublin by the late Professor R. W. Smith (Feb. 4th, 1865), in which the fibro-cartilage appeared to have been displaced by a very unusual form of direct violence. It occurred in a boy of sixteen, who had been wounded in the knee by a hackle-pin, the sharp, curved point of which penetrated the joint on the inner side, and close to the line of the long saphena vein. The boy fell backwards, and the hook tore its way out. Escape of synovial fluid was followed by very severe inflammation, which yielded completely to treatment. On recovery, a certain amount of stiffness of the joint remained,

the limb tended to remain somewhat flexed, and a distinct projection was found in the position of the wound, which presented a curved outline, was somewhat elastic to the feel, and, manifestly, was not of an osseous nature. The diagnosis in this case was that the hook which penetrated the joint had fixed itself in the internal semilunar fibro-cartilage, and in tearing its way out had displaced this structure from its normal position. The possibility of a certain amount of displacement accompanied by laceration, in such a case cannot, I think, be questioned. The evidence afforded by the other cases quoted, as also indeed that derived from the less important examples which we have found recorded by various other surgical authorities, is not so conclusive.

Sir Astley Cooper observes that "under extreme degrees of relaxation, or in cases where there has been increased secretion into the joint, the ligaments become so much lengthened as to allow the cartilage to glide upon the surface of the tibia, and particularly when pressure is made by the thigh bone upon the edge of the cartilage. The cartilages which receive the condyles of the os femoris are united to the tibia by ligaments, and when these ligaments become extremely relaxed and elongated, the cartilages are easily pushed from their situations by the condyles of the os femoris, which are then brought into contact with the head of the tibia; and when the limb is attempted to be extended the semilunar cartilages prevent it." There can be, I think, no reasonable ground for refusing assent to these views—as in the case of extreme relaxation of the ligaments, the existence of which was pre-supposed by this distinguished authority, the parts of the semilunar cartilages between their cornua must of necessity be very freely mobile, and comparatively easily displaced. But the case of a previously healthy joint is a

widely different one; and, as I understand the phrase, "internal derangement of the knee-joint" deals with the latter only.

Before summarising my conclusions as to the state of things existing in the more typical forms of Hey's internal derangement of the knee-joint, I will relate the causes, symptoms, and treatment of the lesion as it has repeatedly occurred in my own person. It has always been the result of *indirect* and, in every instance, *very slight* violence. The force has always been applied in such a direction as to produce rotation at the knee-joint—when already more or less flexed, and with the parts about the joint as relaxed as possible—when, indeed, if the expression be allowable, the muscles were almost or wholly off their guard. It has never occurred to me when the limb was in a decided state of active movement. My first experience of the lesion occurred when a boy of about twelve, as I was slowly sauntering along a country pasture-field, I lightly struck the inner side of the point of my shoe against some elevation in the ground, and was instantly brought to a standstill by pain of an agonising character developed in the interior of the right knee-joint, and on the inner side. Besides the pain, I experienced the mingled sensations of fright and helplessness (as I was alone) to a degree which I have never forgotten. I soon reached the ground by what, I think, may be best described as a mixed movement of sitting and falling. The joint was slightly flexed, the leg slightly rotated outwards, and all will to attempt, and power to carry out, voluntary movement of the limb at the knee were absolutely lost. As this accident occurred many years before my initiation into the mysteries of anatomy, I need hardly say that I made no observations on the position of the bony prominences about the affected joint. But I very quickly applied my hands to either side of the knee, and instinc-

tively made as strong pressure as I was able, with the vague hope of diminishing the pain. The continuance of the pressure had the effect of diminishing the flexion of the joint a little; when, suddenly, I felt an exacerbation of the pain, followed by a loud clucking sensation, which was conveyed both to hand and ear. This sound was followed by instantaneous and complete relief. No sequelæ followed. But the lesion frequently reappeared, from similar causes, and always yielded to the same treatment. It has also occurred when, in moving the right foot under a table, the inner side of the great toe has struck lightly against one of the legs. As at other times, this has occurred only when the knee was flexed, and the muscles which act upon that joint entirely relaxed. The total number of my personal experiences of this lesion would amount, I believe, to at least a couple of score. By exercising the greater caution which those painful experiences have taught me, I have for some years escaped its recurrence; but have from time to time been made to feel that the symptoms had narrowly escaped development.

When I became a medical student, I naturally felt a good deal of curiosity about the slighter lesions of the knee-joint, but it was some time before I heard enough to send me to Hey's original paper. I then at once recognised a description of what I had myself experienced. The hearsay descriptions with which I had been previously acquainted had not given me the same impression. I embraced the first of my opportunities after this enlightenment to inform myself of the probable nature of the "internal derangement of the knee-joint," and have since been often able to make a hasty examination of the outlines of my own joint while still *deranged*. The evidence afforded by manipulation has added all its weight to the negative opinion which I soon formed from other considerations—that the semilunar carti-

lage has never in my case, nor in any corresponding case, been displaced from its tibial attachments. Two prominences could on such occasions be detected on the inner aspect of the joint, one directly internal, evidently formed by the inner border of the internal condyle of the femur; and another, lower down and somewhat to the front, found on the inner side of the ligamentum patellæ, and presenting a better-defined margin. This border, I have no doubt whatever, was formed by the superior margin of the semi-lunar fibro-cartilage, still attached to the upper end of the tibia.

Accordingly, my explanation of the nature of this lesion, which I look upon as a typical example of Hey's internal derangement of the knee-joint, is that by the combined slight rotation and external flexion—if I may be allowed to coin a new term—given to the leg, the tibia, with its adhering internal cartilage undergoes a process of subluxation. The articular end of the condyle being *jerked over* the upper edge of the latter structure, and there becoming hitched, the tibia has its upper extremity locked in a position of slight rotatory displacement forwards and outwards.

A similar rotation of the leg in the opposite direction, and an analogous displacement of the outer condyle constitute, I believe, the actual lesion in the comparatively rarer form of "derangement" which affects the outer section of the knee-joint. This relative infrequency is, to my mind, quite satisfactorily explained by the greater mobility of the external cartilage, and the existence of strong femoral attachments, which secure its adaptation to the varying positions of the outer condyle.

Such I believe to be the only form of displacement which can occur in the previously normal knee-joint as the result of slight or indirect violence.

The lesions which occur in pathological conditions I have

designedly excluded, as I do not think that they should be examined under this head.

In concluding this rather lengthy communication I feel it to be my duty to apologise to my hearers for taxing their patience so heavily in a somewhat egotistical attempt to throw a critical light on an item of surgical mythology; and to reiterate with renewed emphasis the statement that an *immediately reducible* displacement of a fibro-cartilage of the normal knee-joint, such as most people seem to understand by "*Hey's Internal Derangement*," has never yet occurred.

MR. T. MYLES thought that the most striking feature of the descriptions in the text-books of this injury was the apparent total ignorance of the ordinary elementary anatomy of the knee-joint. He had seen a considerable number of cases. In two cases he opened the joint expecting to find a loose cartilage, but found a pedunculated cartilage in the knee-joint. One case had a history pointing to displacement of the internal semilunar cartilage, but he found a small pedunculated cartilaginous body, growing from the front of the joint, projecting between the condyle and tibia. On two other occasions he found the anterior attachments of the internal semilunar cartilage completely torn away. In every case in which he removed a piece of the cartilage the patient always complained of permanent weakness in the joint. Skiagrams of the affection he considered to be most misleading and absolutely futile, and the length of the ligamentum patellæ would be compensated for by the increased contraction of the quadriceps extensor.

MR. R. C. B. MAUNSELL had removed a semilunar cartilage a year ago from a girl's knee. She had complained for several years of recurrent attacks of the dislocation. Recovery was rapid, and patient now perfectly strong.

MR. CROLY said that he had seen some important cases of this condition. One case, a gentleman, came to him with one knee slightly flexed and hopping on the good leg; his knee-joint was "locked." Extension, followed by sudden flexion, gave instant relief, and the patient insisted on walking home. The interesting thing was the slight violence causing the affection, but that applied to all dis-

locations. The joint was locked in all the cases he had seen. The reason why the external cartilage was not displaced was that the popliteus tendon tied it so tightly in its groove. He thought there was a difference in symptoms of loose cartilage and this affection. The former caused a sickening sensation within the knee itself, whereas the latter caused intense pain over the line of the internal semilunar cartilage. He thought that Mr. Maunsell was very fortunate in the case where he had removed the cartilage, but he did not approve of the proceeding.

DR. KNOTT, in reply, said that he believed the apparatus mentioned by Mr. Lentaigne to be very good for converting the knee into a hinge-joint. He agreed with Mr. Myles regarding the misleading character of the skiagrams. It was a remarkable fact that direct cutting of ligamentous structures is attended with comparatively slight pain, whereas stretching a ligament is most painful. Regarding Mr. Maunsell's case, it was beyond his comprehension how a perfectly sound knee was left.

NOTE ON THE METHODS OF ADVANCING THE RECTI MUSCLES OF THE EYEBALL.

By J. B. STORY,

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[Read in the Section of Surgery, April 7, 1899.]

ON giving notice to the Secretary of the subject of this communication I thought I would have a complete novelty to bring before you this evening. But alas for the uncertainty of human hopes ! The operation which I have been cherishing for more than three years as my peculiar property has been already described by no less than two oculists—one in France and one in Germany. The second of these in order of time is Dr. E. Praun, of Darmstadt, whose paper appeared in the *Centralblatt für praktische Augenheilkunde*, in September, 1898.

When I read his paper I felt that I had lost an opportunity of enlightening the ophthalmological world that would never return, and for more than a month I regarded Dr. Praun with mingled feelings of admiration and envy. But at the end of the month a note appeared in an ophthalmological periodical which informed me, and also Dr. Praun, that the operation had been described by Dr. E. Valude in the *Annales d'Oculistique* so long back as August, 1896 ; so that priority belongs neither to me nor Praun, though probably in his case, as certainly in mine, the operation was devised quite independently of Dr. Valude's publication.

For my part, I was doing the operation so long ago as March, 1896, as the routine method, and have been, for more than three years, demonstrating it to the students of St. Mark's as my own, until the appearance of Dr. Praun's

paper, above-mentioned, called my attention to Valude's publication in the *Annales d'Oculistique* of August, 1896.

Before describing the operation which I have devised I may perhaps mention briefly some of the various methods which have been proposed and practised for advancing the recti muscles since V. Graefe first originated a definite though imperfect method for effecting the object in view. One of the most ingenious is that of Weber. This is the method I learnt as a student at Zurich from the late Professor Horner, and practised during the earlier part of my professional life. In it three needles are used and one suture. The suture doubled is passed through the first needle, and the two free ends are threaded through the other two needles. The first needle then is passed through the tendon from the scleral aspect, and passed through Tenon's capsule and conjunctiva also. It is then taken off the suture which leaves a loop of suture projecting from the external surface. The other two needles are then passed under the conjunctiva to the upper and lower borders of the cornea respectively. Each of them is then passed through the before-mentioned loop (of course from opposite sides), and by tying them together the tendon is drawn forward till it lies as close to the border of the cornea as is thought necessary. This operation has lately been described by an oculist in the Antipodes as a new operation. It may be new in the Antipodes, but is old in Europe. It is an operation which often produces brilliant results, but occasionally fails, and it was these occasional failures which induced me to give it up. The failures are, I believe, due to the difficulty of obtaining firm union between the end of the tendon and the eyeball, which difficulty is, I fancy, caused by the fact that the suture does not closely unite the tendon to anything at all. The end of the tendon may be pressed closely to the actual border of the cornea, but the sutures which hold it in this position are attached to a

portion of conjunctiva removed some distance from the border of the cornea to which the tendon is pressed.

The operation is, I think, superior to the ordinary method as described in Mr. Swanzy's admirable text-book, and which I take to be the modern type of Critchett's operation. In it a suture is knotted round each side of the tendon, and then each suture is passed up under the conjunctiva to the upper and lower border of the cornea respectively, and then securely tied. I have frequently done this operation, and usually found great difficulty in removing the sutures. The operation has no points of superiority to Weber's, and has one very great defect from which Weber's is free—viz., if one suture gives way before the other the globe is rotated round its antero-posterior axis, and a satisfactory cure of the squint is not obtained. It was, however, when knotting the sutures round the tendon in this operation that the idea occurred to me of splitting the tendon longitudinally, and in my earlier operations I used to knot the sutures regularly in this way. This knotting of the two sutures round the tendon has also, I see, been the means of suggesting to Dr. Valude the methodical splitting of the tendon as part of the operation. He states that he observed in doing the usual operation that a good result only followed when the tendon was accidentally split longitudinally by the pull of the sutures, and he, therefore, conceived the idea of making the division of the tendon a regular part of the operation.

Schweigger's operation is rather a shortening of the muscle than an advancement of the insertion. He exsects a piece of the tendon or muscle, and sutures the proximal end to the original insertion. I have done this operation frequently, and though it has been a brilliant success in some cases I have not found it nearly as satisfactory as the method of splitting the tendon. In the latter the muscle is really advanced and encircles a larger portion of the globe, and, thereby, a much

greater effect is produced than by merely shortening the muscle and attaching it to its old insertion.

Many operators fix the sutures into the sclerotica, as the conjunctiva affords such a fragile tissue for the attachment of sutures; but, since I have adopted the device of splitting the tendon and using glass beads, I have found the sutures holding perfectly in the conjunctiva alone, though, of course, if it is wished they can be passed also into the sclerotica.

Prince, in the operation he describes as the pulley operation, passes the pulley suture into the sclerotica. His is another of the operations I have tried and discarded in favour of the operation I shall now describe.

The usual conjunctival incision is made tangentially to the corneal periphery, and the tendon is exposed in the usual way, and fixed by means of Prince's forceps. It is then separated from its scleral attachment. Two doubly-armed sutures are used. The needle at one end of a suture is passed through the tendon from its external aspect as close to the edge of the tendon as possible. The needle at the opposite end of this suture is passed also from the external surface pretty close to the centre of the tendon. Half of the tendon is thus caught in a sort of loop. The other half is then engaged in a precisely similar loop. An assistant then pulls on the two needles of one of these loops while the operator pulls on the needles of the other loop, and divides the tendon longitudinally by a snip of the scissors. The two needles of each loop are then passed under the conjunctiva, and brought out as close to the ends of the vertical diameter of the cornea as the conditions of the case require, a short distance intervening between the points of exit of the two needles of the same loop, and then the ends of each loop are firmly knotted together over a small glass bead. The glass bead serves to prevent the sutures cutting through the conjunctiva, and also enables the suture to be removed more easily after union of the tendon has been obtained.

From the description it may seem that the operation must be a tedious one, but I find it quite as rapid in performance as any other method which I have tried, and I believe I have tried nearly all that have been published.

The advantages of this particular method are—(1) The tendon is closely united by a firm knot to the actual spot to which it is desired that it shall adhere, and not connected by a longer or shorter band of suture to a point some distance from the spot to which it is to adhere. (2) The muscle is really advanced, and by encircling a larger portion of the circumference of the globe obtains a greater power of rotation than it can get in Schweigger's operation, for instance. (3) The way in which the sutures are inserted in the tendon makes the strain on them to be at right angles to the direction of the fibres, and thus avoids the necessity of knotting the sutures in the tendon before attaching them to the globe, as has to be done in several of the other methods. (4) The splitting of the tendon allows a perfectly symmetrical advancement of the muscle to be made, so that the muscular force will act in the same plane as before the operation, and not produce any rotation round the antero-posterior axis of the globe. This perfectly symmetrical advancement is difficult to obtain in many of the other methods. In this there is no difficulty whatsoever. (5) The broad, or rather the long, contact of the split tendon with the globe affords a better prospect of union between them than is offered in most other methods. (6) The use of the glass beads keeps the sutures from cutting through the tissues, and enables the operator to remove them easily when union has been obtained. (7) There is no disfigurement produced by puckering or swelling of the conjunctiva, which is not infrequent in many other operations.

It is unnecessary to state that a piece of tendon may be excised in this operation if the conditions of the case require it.

It is not, in my opinion, possible to lay down general rules on the indications for advancement of the recti muscles, but I may briefly mention what my usual practice is. When the squinting eye is more or less amblyopic, and the angle of squint more than 20 degrees, I usually perform a tenotomy of the antagonist with an advancement of the defective muscle, but if the visual acuity of the two eyes is nearly equal I mostly tenotomise the two internal recti. This refers to convergent strabismus. In internal strabismus, again, of 30 degrees and upwards, I usually tenotomise both internal recti and advance the external rectus of the squinting eye, if necessary exsecting a portion of the tendon as well. In external strabismus above 20 degrees I usually perform an advancement in addition to tenotomy of both external recti, and in case of amblyopia of one eye in external strabismus I nearly always do advancement with tenotomy of one or both external recti.

MR. BENSON had seen Mr. Story perform the operation and was impressed by the satisfactory results. He himself had employed a modification of Schweigger's operation, and frequently shortened the tendon rather than advance it to the edge of the cornea, and had been well satisfied with the results. In his modification of Schweigger's operation it was necessary, in order to avoid strain on the sutures, to put in an anchor suture. The pulley operation was a most abominably complicated thing to do. He thought it probable that for the majority of cases the operation described by Mr. Story would answer the purpose better than any other single operation.

MR. MAXWELL said that Mr. Story's seemed a good operation. In Mr. Swanzy's operation, the tying of the knot round the tendon and the subsequent burying of that knot was a very grave drawback, as the suture was removed afterwards with great difficulty. However, in Mr. Swanzy's operation the tendon was really split. Shortening operations and advancement operations had practically the same ultimate results. When a tendon is advanced it is not the

cut end alone which unites to the eyeball, but the conjunctiva having been raised up from the globe, a raw surface is left below and above, and the tendon becomes adherent to that raw surface at the level of its division to the eye. The great objection, he thought, in almost all operations, is that the tendon is divided, and if any slipping should occur, the patient's condition is worse than formerly. Another objection is that the suture is inserted into the tendon at one side, which is firm enough provided the thread is carried across the tendon, but the other end is inserted into the conjunctiva, which is soft and delicate and easily torn. He described a method of his own to obviate slipping, in which tendon was stitched to tendon and the muscle was not divided at all, and even if slipping should occur, the original condition would remain.

MR. CROLY also remarked on the communication.

MR. STORY, in reply, said he had not done Mr. Maxwell's operation. There was not the same chance of one of the sutures giving way in the operation he himself had described as in many of the other operations, because the only pull in it was directly along the tendon to the conjunctiva. In other operations where the tendon is not divided in two, and where there is a pull from one side of the tendon, the lower suture actually pulled on the upper one, and there is a much greater chance for the sutures to cut through. Dr. Valude's reason for introducing the practice of splitting the tendon was because he found it was only those of the older operations were successful in which the tendon split accidentally. He himself had never noticed the tendon split during the operation.

GASTRO-ENTEROSTOMY.

By CHARLES B. BALL, M.Ch., F.R.C.S.;

Regius Professor of Surgery, Univ. Dubl.

[Read in the Section of Surgery, May 12, 1899.]

THE formation of a fistula from the stomach to the small intestine, for the purpose of providing an alternative route for food, in cases of stenosis of the pylorus, first practised by Wölfler in 1881, is an operation which now may be said to be well established; and although it probably cannot compete with pyloroplasty in benign strictures, and pylorectomy in early cases of cancer, it has its undoubted sphere of usefulness in those cases of malignant disease where owing to extensive infiltration of the tissues, or considerable involvement of the mesenteric glands, the more radical operation is impossible.

No one, I take it, questions the urgent necessity of tracheotomy where the larynx has become widely implicated with carcinoma, and dyspnœa is well marked; or of colotomy where intestinal obstruction has become prominent in extensive cancer of the rectum. Surely then it must be admitted that a patient with obstructed pylorus, gradually dying of starvation, with the vomiting and other discomforts of a dilated stomach, is just as much in need of surgical relief; and if gastro-enterostomy is undertaken in time, before the vital powers are too much undermined by starvation, much suffering will be obviated, and life certainly prolonged. We must remember that many cases of cancer in the abdominal cavity are of tolerably slow growth, although such complications as pyloric stenosis, or other form of intestinal obstruction may early be pronounced, and that if the patient is relieved from the obstruction the continued progress of the case may still be slow.

Like many operations of recent introduction the methods

which have been employed exhibit considerable variety. At first it was only considered necessary to pick up a loop of the small intestine, bring it over the great omentum and transverse colon, and effect a lateral anastomosis with the front of the stomach. Such an operation is in many cases unsatisfactory. In the first place, the displacement of the transverse colon with the great omentum is a clumsy and dangerous arrangement; and, secondly, unless great care is taken to see that the loop of small intestine employed is high up in the jejunum, an insufficient length of small intestine for purposes of digestion may be left. This accident has happened on several occasions, the loop selected being down low in the ileum, the operation being followed by the rapid wasting of the patient, with passage of undigested food.

I have only personal experience of one case of the operation performed in this way; the patient died in a few days, the character of the vomit showing that regurgitation of intestinal contents into the stomach through the fistula had taken place. Köcher also has noted several cases which apparently were fatal owing to this cause, and has devised a plan of operation by which the opening between the two viscera will be valvular. In this way he hopes to avoid regurgitation.

Any form of lateral anastomosis must render the escape of the contents of the duodenum containing bile and pancreatic fluid into the stomach extremely probable, and that it does often occur, is proved by the fact that bilious vomiting has frequently been noted after these operations. In order to meet this difficulty Wölfler has suggested the cutting of the loop of the jejunum quite across, and continuing the incision for a short distance into the mesentery. The distal end is then inserted into the stomach while the proximal end is implanted laterally into the jejunum. This method has the great advantage of delivering the bile and pancreatic fluids into the intestine some inches away

from the stomach, while the opening from stomach to jejunum is both ample and in a direct line; the disadvantages are, however, that it necessitates a double junction, which increases the time necessary for the operation, while the risk of subsequent leakage is obviously increased two-fold. Moreover, there is added to the operation the treatment of a considerable wound in the mesentery, which is often a matter of some difficulty. Notwithstanding these drawbacks, I am unhesitatingly of opinion that the method of complete division of the knuckle of intestine and mesentery and double junction is by far the best that can be adopted in these cases.

In order to avoid the displacement of the colon and great omentum necessary in anterior gastro-enterostomy, Von Hacker and Courvoisier have endeavoured to reach the posterior surface of the stomach by making an opening through the transverse meso-colon and suturing the edge of the rent to the stomach; the gastro-enterostomy can then be completed without difficulty. I believe that it is quite unnecessary to suture the margin of the rent, and have not adopted it in my cases. The disadvantages urged against this procedure are:—First, that the rent in the meso-colon is likely to contract subsequently, and secondly, that owing to the depth, it is not possible to effect the junction outside the abdominal wound, and consequently the stitching becomes much more difficult. If the opening in the meso-colon is made sufficiently free, two or three times as large as appears necessary at first sight, subsequent contraction need not be feared; and in my cases, owing to the dilated condition of the stomach, I have not experienced the slightest difficulty in effecting the junction with the stomach and jejunum outside the abdominal wall.

Many ingenious methods have been recommended by Barker, Halstead and others for preventing extravasation either from the stomach or intestine, by carefully suturing the serous surfaces before the viscera are themselves opened

into. Such methods are unsatisfactory, as they do not sufficiently fix the mucous membrane which, in the stomach especially, is freely movable on the muscular coat; moreover, they appear to me to be quite unnecessary, as with due care extravasation can readily be avoided.

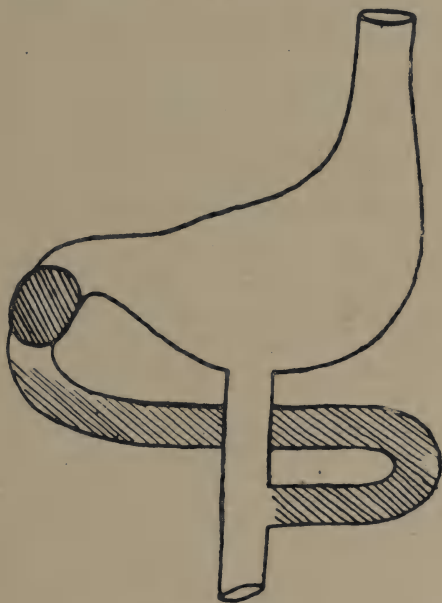


FIG. I.

Wölfler's method of gastro-enterostomy by complete division of the jejunum, and emplantation of the *distal* end into the stomach with anastomosis of the proximal end laterally into the jejunum.

For effecting the operation I have found the bone rings, which I have already introduced to the notice of the Academy, for end to end junction after enterectomy to answer extremely well; it is, however, necessary to use them with separate purse-string sutures, as recommended by the late Mr. Greig Smith, instead of the primary continuous suture which acts so well for end to end junction.

An illustrative case will best indicate the method of procedure.

CASE I.—Mr. B., aged sixty, was first seen in consultation with Dr. Hawtry Benson, in April, 1898. He was extremely emaciated, vomiting large quantities of fluid, with a largely dilated stomach, in which splashing could easily be demonstrated; an obscure tumour was also felt in the region of the pylorus.

Having first thoroughly washed out his stomach with boric lotion, his abdomen was opened by vertical incision through the left rectus muscle. An examination showed the tumour of the pylorus to be much too extensive for removal, numerous enlarged glands being present. The great omentum and transverse colon were, therefore, drawn out of the wound, and protected by an aseptic towel; the commencement of the jejunum was now readily found, its continuity with the duodenum partially covered by peritoneum being easily determined; a loop was withdrawn from the wound, carefully emptied by pressure with the fingers, and controlled by an assistant. An incision was now carried across the bowel, and for about $1\frac{1}{2}$ inches into the mesentery, the cut mesentery being topsown with a continuous suture of very fine catgut, which passed through both layers of peritoneum, and quite stopped all bleeding. A purse-string suture of silk was now passed round each lumen of the bowel, and a decalcified bone ring, temporarily closed with a plug of gauze put into each, and all the sutures closed. An incision was next made in the long axis of the distal portion of the jejunum, opposite the mesenteric border, and, about three inches below the free end fixed to the ring, this incision was surrounded by a purse-string suture of silk, and the ring fixed in the duodenal end taken; the gauze plug being removed, and rapidly buttoned into the vertical incision in the distal portion of gut, the purse-string closed and a continuous suture of fine silk passed by Cushing's method round the entire circumference of the peritoneal surfaces where they were in apposition. The transverse meso-colon was now torn through at a point where no large vessels were to be seen, and a considerable sized opening made. Through the opening a pouch of the posterior wall of the stomach could, owing to the extremely dilated state of that viscus be readily drawn, and brought out at the abdominal wound. It was held well up, and controlled by an assistant while an incision was made into it, and surrounded by a purse-string suture; the ring fixed in the distal end of the jejunum was then buttoned into this incision, the gauze plug having of course first been removed, and the junction completed by a Cushing suture as before. The parts were now cleansed carefully, but practically there had been no extravasation, they were dropped back into position, the colon and omentum laid over them, and the wound closed. Feeding was

commenced with fluid nourishment as soon as the patient recovered from the anæsthetic. This I consider an important matter as these patients are always much emaciated for want of food, and extravasation need not be feared if the operation has been properly done. No vomiting occurred; the man took nourishment freely from the first, and rapidly began to improve. The stitches were removed on the 8th day, the wound being absolutely aseptic. On the following morning I found the dressings soaked with bloody serum, and on taking them down found the colon, and omentum prolapsed through the wound, which had given way along its entire extent the previous night, during a violent fit of coughing.

The prolapsed viscera were carefully cleansed and returned, the wound being again sutured under anæsthesia by gas and oxygen, and I am glad to say no ill effects followed. It taught me, however, an important lesson, not to remove the sutures in these cases for a few days longer than is usual in general abdominal work, as owing to the extreme emaciation repair is somewhat delayed. While the abdomen was thus re-opened I felt for the decalcified rings, but could find no trace of them, the double intestinal junctions being perfect, and with no trace of peritonitis about them. I consider it probable that in the stomach and upper bowel the decalcified bone is much more rapidly dissolved than it is lower down in the intestine. Two months after the operation the gentleman wrote to me saying he had increased 2 stone in weight, was walking to his office and home again, a distance of three miles daily, and feeling very well. He however subsequently developed secondary cancer of the liver, of which he died six months after operation.

CASE II.—In a case sent me by Dr. Thompson of Omagh, a similar operation was performed, except that the proximal end of the jejunum was implanted into the stomach, and the distal end laterally implanted into the lower portion of the loop thus formed (Fig. II.). In this way, probably, gastric digestion is more efficiently carried on, as in the small piece of intestine between the two buttons, peristalsis is directed towards the stomach, so that this viscus is not continually drained as in the former operation, but is only emptied by an expulsive effort, when gastric digestion is complete. In this way the function of the pylorus is imitated in the alternative route provided by the gastro-enterostomy. In this case the macroscopic appearances, at the time of operation, were those of cancer with a considerable tumour of the pylorus, and many inflammatory adhesions around, which quite negatived the operation of pylorectomy. The

patient made a rapid recovery, and 10 months after reported himself as in perfect health, so that it is probable the diagnosis of cancer was erroneous.

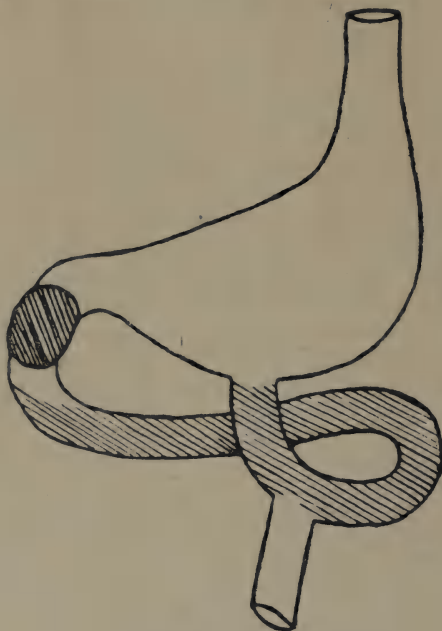


FIG. II.

Author's method of gastro-enterostomy by complete division of the jejunum and emplantation of the *proximal* end into the stomach with anastomosis of the distal end laterally into the jejunum.

MR. P. J. FAGAN remarked on the rapidity of Murphy's button over simple suture.

MR. M'ARDLE took exception to the term gastro-enterostomy, as a gastro-enterostomy lower down was not surgery at all, and he thought that they should confine themselves to the term gastro-jejunostomy. Herniation might occur in anterior gastro-jejunostomy, and, therefore, the operation should be exterminated. In a case of anterior gastro-jejunostomy performed by himself persistent churning up of bile in the stomach occurred, and every morning patient vomited three or four ounces of acid bile, which was very distressing. He liked the operation of posterior gastro-

jejunostomy, which was simple. From 1890 till the present he had done eight operations successfully, and all the patients were still alive. He was against continuous suture as done by Lauenstein, and believed that a high mortality attended the application of any method of continuous suture in posterior gastro-jejunostomy. He was glad to see that Mr. Ball used the purse-string suture advocated by Murphy in lateral junction of the bowel. He disliked a bobbin such as Mr. Ball's, as it left uncontrolled a piece of inverted bowel wall, and was liable to cause stricture. About two per cent. of Murphy's button on the market were real, the rest were made for tradesmen's profits.

MR. E. H. TAYLOR had seen Mr. Ball perform his operation, and he was greatly impressed with the ease with which it was carried out. He believed that the bone rings were preferable to simple suture. He did not approve of Murphy's button, as the chances of its becoming impacted were very great, and also the difficulty of the button of the size he would like to use, passing the ileo-caecal valve, were very great. He held that any operation which fixes the intestine either behind the posterior wall of the stomach, or the anterior wall where the loop is not divided, is not a good operation.

DR. A. R. PARSONS had recently had three patients on whom the operation was performed. The first was a woman between fifty and sixty years of age, who had been operated on successfully for sub-phrenic abscess, and three months later came to hospital with extreme dilatation of the stomach, with persistent vomiting and emaciation. He felt a very large tumour in the right hypochondriac region, and diagnosed it as non-malignant. Mr. Croly performed the operation on her by Murphy's button. As far as the operation went nothing could have been more successful. Death followed in two days. *Post-mortem* showed nothing to account for death. The second case was that of a woman between thirty and forty years of age. She suffered from persistent vomiting, and became emaciated very rapidly. A tumour was palpated in the neighbourhood of the pylorus. Examination of the gastric contents showed it to be malignant obstruction of the pylorus. Mr. Johnston performed a posterior gastro-enterostomy. Patient remained perfectly well for three months afterwards, but the disease spreading, vomiting again occurred, and death followed six months after the operation. The third case was that of a man thirty years old. Examination of the gastric contents proved him to be suffering from malignant stricture

of pylorus. Mr. Johnston performed a posterior gastro-enterostomy, and recovery was good. He thought that anterior gastro-enterostomy was a bad operation. He was greatly struck by the extreme simplicity by which the anastomosis could be done by Mr. Ball's bobbin. He thought it might be better to plug the bobbin with some kind of a sterilised cork, instead of plugging with gauze, to insure prevention of extravasation during operation. Had an examination of the gastric contents been made in Mr. Ball's cases? He had listened with great interest to Mr. M'Ardle's operations, but unfortunately he had not mentioned what they were done for.

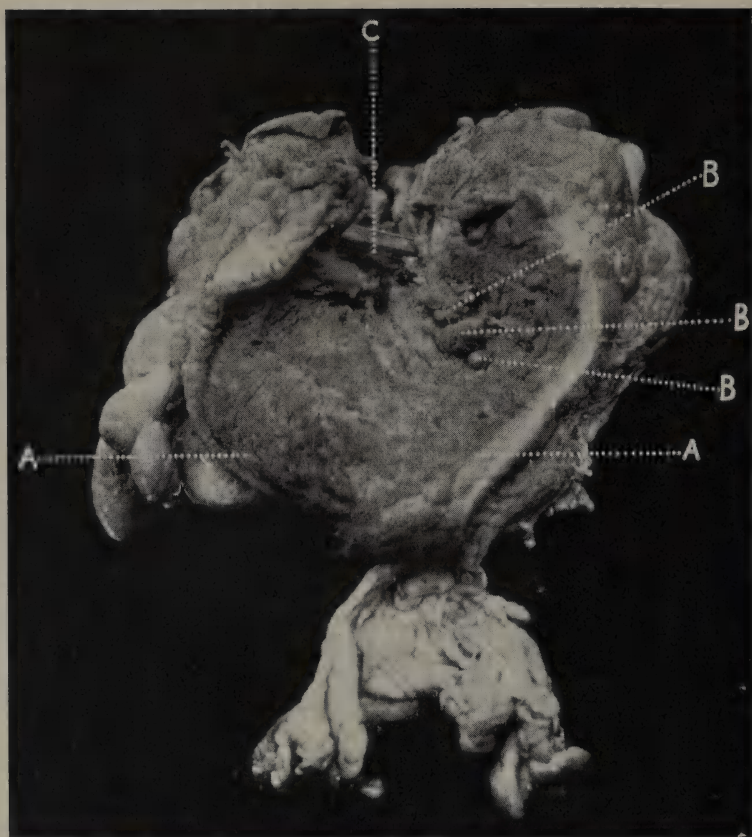
MR. M'ARDLE said that all his operations had been done for benign stricture.

MR. CROLY said that he was amazed at hearing Mr. M'Ardle say that all his operations of gastro-enterostomy for eight years were alive. He thought that it was more the method of operating than the button that was of importance.

MR. G. J. JOHNSTON said that Dr. Parsons had made a mistake, as he (Mr. Johnston) had used Mr. Ball's bobbin in both cases. He believed in the posterior operation, and not the anterior. He thought that the direction of the currents of the contents of the stomach and intestine should be the same in both. In his second operation, he used lateral sutures as an addition to prevent kinking.

MR. BALL, in reply to Dr. Parsons, said that free HCl was absent in the first case; he forgot whether it was absent in the second case. His experience of anterior gastro-enterostomy had been very unsatisfactory. He did not understand how Mr. M'Ardle had done a gastro-jejunostomy through the gastro-colonic omentum. Mr. M'Ardle's record of eight consecutive cases for eight years was very remarkable. He had not altered the shape of his button, and the purse-string suture was first used by Mr. Greig Smith, and was the only form applicable to a lateral anastomosis. He believed that Murphy's button would soon be obsolete. Mr. Parson's suggestion about a cork in the button was very good, but he had always found gauze to answer the purpose. In the second case on which he operated, on introducing the fingers into the stomach, the pyloric orifice represented a virgin os uteri, so that scarcely any contents of the stomach were finding their way into the duodenum at the time of the operation. He thought that regurgitation of the duodenal contents into the stomach was likely to occur in posterior gastro-enterostomy so long as a loop of intestine were simply lateralised to the stomach.

MR. LENTAIGNE ON RESECTION OF ILEO-CÆCAL REGION FOR
CHRONIC OBSTRUCTION.



ILEO-CÆCAL REGION ALTERED BY CHRONIC INFLAMMATION.

- A. Hypertrophied wall of ileum.
- B. Papillæ on inner aspect of ileum.
- C. At C a section from above has been made and piece of wood inserted to keep parts asunder.

A CASE OF CHRONIC INTESTINAL OBSTRUCTION
TREATED BY FORMATION OF INTESTINAL
FISTULA WITH SUBSEQUENT EXCISION OF
CÆCUM AND PORTION OF ILEUM.

By JOHN LENTAIGNE, F.R.C.S. ;
Surgeon to the Mater Misericordiæ Hospital.

[Read in the Section of Surgery, January 20, 1899.]

MR. JOHN LENTAIGNE exhibited a patient from whom he had removed the cæcum and a small portion of the ileum for chronic intestinal obstruction, resulting from stricture at the junction of the ileum and cæcum. The patient, a girl aged twelve, had come under his care on April 16th, 1898. She was then in a very miserable condition, vomiting frequently and rejecting almost all food, and complaining of constantly recurring attacks of severe pain in the abdomen; the abdomen was greatly distended, and the attacks of pain were usually accompanied by visible peristaltic movements of the intestines, which formed large tumours under the parietes, moving slowly in various directions. These attacks would last for one or two minutes, after which the patient would be free from pain. The bowels were very constipated, no motion ever coming except after the administration of purgatives followed by enemata. These troubles had commenced two years before, and from then the girl had been steadily getting worse up to the date of the first operation. On April 22nd Mr. Lentaigue opened the abdomen in the median line. Huge coils of intestine, which proved to be the ileum enormously distended and with greatly thickened wall, came out at once. On passing the hand along this enlarged intestine it was found to end in a hard mass firmly bound down by adhesions in the right iliac fossa. It

was impossible to bring this mass into view as the patient was almost moribund before the operation. Mr. Lentaigne decided to give temporary relief by forming an intestinal fistula in two stages, after first emptying the distended bowel by enterotomy. On incising the gut two large basinsful of pea-soup-like faeces flowed out, and the intestinal cavity was irrigated and washed out with a stream of warm water; the opening was then closed by silk sutures and the gut was returned to the abdominal cavity. The left hand of the operator was introduced into the cavity and directed well over to the left side; it was then cut down upon and the bowel securely fastened to the opening by a few sutures passing through the parietal peritoneum, muscle and skin. The incision in the median line was closed with three layers of sutures, the two deeper of silk for peritoneum and muscle, and the superficial of catgut for the skin, covered by a layer of celloidin. The small opening on the left side of the abdomen was kept open by a plug of iodoform gauze, and on the third day after operation the fistula was made by an incision into the bowel. There was an immediate improvement in the patient's condition. The bowels emptied themselves continuously through the fistula, and the vomiting and attacks of pain ceased almost at once. On June 27, as the patient had got into a good condition, and was anxious to be relieved of the annoyance of the fistulous opening, excision of the caecum was performed, with end to end suture of intestine by Köcher's method, through an incision over the diseased area. The bowels acted naturally four times on June 29, and almost every day after. There was considerable delay in the healing of this wound, as infection of the silk used in suturing seemed to have occurred, the silk slowly coming away through a small sinus at the upper end of the wound, and it was not completely healed until October, 1898. The intestinal fistula

MR. LENTAIGNE ON RESECTION OF ILEO-CÆCAL
REGION FOR CHRONIC OBSTRUCTION.



ILEO-CÆCAL REGION ALTERED BY CHRONIC
INFLAMMATION.

CÆCAL ASPECT.

- A. Wall of cæcum.
- B. Polypoid growths projecting into cæcum from stenosed ileo-cæcal valve.
- C. At C a section has been made from above.

closed of itself as soon as the bowels acted normally, and on July 12th it had practically closed, neither fæces nor flatus coming through it. It was now represented by a firm, clean scar, no trace of the opening existing. The patient was shown to be in excellent health and condition, the bowels acting regularly every day.

The specimen which was removed was remarkable in many ways. When it was first examined there did not seem to be any passage between the ileum and the cæcum. On examining more closely several tiny openings on the surface of hard nodule-like papillæ were found on the surface of the *cul-de-sac* on the ileum side of the specimen. On applying one of these papillæ to the water tap several rose-like jets spurted back from the other papillæ; a little water also came out through the colon side of the mass. The walls of the ileum were enormously thickened; at the point of section they were apparently nearly half an inch thick. The outer surface of the mass was covered by adherent omentum containing in its tissue a considerable amount of fat, which was remarkable considering the wasted condition of the patient generally. On the colon side of the specimen the walls were rather thinner than normal, and the large intestine so-called was, in this patient, very much the smaller of the two. At what seemed to be the cæcal side of the ileo-cæcal valve a number of polypoid growths, from a quarter of an inch to an inch in length, and about a quarter of an inch in diameter, projected into the cæcum. On passing a probe through one of the minute openings on the ileum side of the valve it was found possible to push it into the cæcum. On section through the intestine at this point it was found that these polypoid growths sprang from the mucous membrane of the cæcal side of the valve. The communication between the large and small intestine was only sufficient to admit an

ordinary probe. No sign of a vermiform appendix could be found anywhere in the specimen. It was assumed that the diseased conditions found were the result of chronic inflammatory troubles following upon appendicitis.

MR. WHEELER asked if Mr. Lentaigne was sure he was correct in giving the diameter of the small intestine as four inches. Regarding the fistulous opening, was it a form of colotomy that was performed? In his practice in colotomy he always supported the intestine by placing a glass rod underneath it.

MR. LENTAIGNE, in reply to Mr. Wheeler, said that the diameter of the small intestine was exceedingly large, and appeared to be about four inches when made flat by evacuation of the contents of the gut. The opening was made into the small intestine above the obstruction, and was merely an intestinal fistula, not an artificial anus. He merely made an opening into the bowel, after having attached the bowel to the parietal peritoneum and skin. This was quite efficient as a means of relieving obstruction, and could be subsequently cured without trouble. The fistula, in fact, often closed without operation. It had always done so in his cases up to this, and he had had several in which he had employed this method. Another advantage was that the bowel below the fistula still functioned as far as possible, and did not, therefore, contract like the intestine below an artificial anus. Intestinal anastomosis by short circuiting was rejected at the first operation as much more dangerous than the procedure adopted, as the small intestine was enormously thickened and the colon contracted and thin-walled to an extreme degree.

SECTION OF OBSTETRICS.

ONE HUNDRED CASES OF ABDOMINAL SECTION.

By ALFRED SMITH, M.B., M.A.O., R.U.I.;

Gynæcologist to St. Vincent's Hospital;

Examiner in Midwifery, R.U.I.

[Read in the Section of Obstetrics, November 25, 1898.]

I HAVE pleasure in presenting to you a report of work done by me in gynæcological abdominal surgery since May, 1896. I published in that year a report of my first 50 abdominal sections, and I now bring under your notice a report of 100 cases as follows:—

The 100 abdominal sections were performed as follows:—Thirty-nine times for ovarian tumours (28 cystic, 9 solid, and 2 dermoid); 4 times for the separation of adhesions; 9 times for exploratory purposes; 21 times for the cure of fibro-myomata; once to enucleate a broad ligament fibro-myoma; 4 times for tubal pregnancies; 4 times for the radical cure of ventral hernia, following the operations of my friends; 4 times for double pyosalpinx; once for appendicitis; once for double hæmatosalpinx; once for enucleation of mesenteric cyst; once for Porro's operation; twice for salpingo-ovaritis; twice for hydrosalpinx; once for the enucleation of a broad ligament cyst. I also opened the peritoneal cavity twice in performing anterior colpotomy, and three times in performing posterior colpotomy—making in all 100 cases with two deaths.

Table of Abdominal Sections.

No.	Sent by	Assistant	Name	Age	W. S. M.	Date of Operation	Disease	Features of Operation	Result	Remarks
52	Dr. Keelan, Dunleer	-	L. M'K.	29	S.	May 6, 1896	Irreducible back- ward displacement of uterus	Surface and spider- web adhesions broke down; stitched to abdominal wall	Cured	Required pes- sary
53	—	Dr. Benson	S. G.	46	S.	May 22, 1896	Difficult to diagnose tumour	Exploratory; tumour fibro-myomata	Recovery	No urgent symptoms
54	Dr. Walsh, Clonliff	Dr. Howley, house surgeon	M. M.	42	M.	June 3, 1896	Multiple fibromata	Enucleation of three fibroids; uterine wound closed by ter- race sutures	"	
55	Dr. Harold	Dr. Tobin	E. R.	28	M.	Aug. 17, 1896	Ruptured tubal preg- nancy	Blood clots removed by douch saline	"	Fetus with ruptured tube
56	Dr. Byrne, Derry	Drs. M'Arde and Tobin, and Dr. Byrne, Derry	M. M'G.	35	M.	Oct. 24, 1896	Ovarian papilloma, size sixth month pregnant uterus	Cyst ruptured before operation; extensive adhesions; sprouting masses coming through capsule	"	Patient died 1 year after operation from cancer
57	Dr. Fullam, Swords	Dr. Joseph M'Arde	M. C.	50	W.	Nov. 14, 1896	Malignant disease of peritoneum	Exploratory	"	
58	Dr. Paul Dillon, Killarney	Dr. Howley, house surgeon	M. B.	36	M.	Dec. 1, 1896	Fibro-myoma; soft; interstitial	Panhysterectomy	"	
59	Dr. Considine, Dundrum Asylum	"	J. K.	23	S.	Dec. 12, 1896	Ovarian cystoma	—	"	

60	Dr. Fox, Stephen's-green	"	"	"	M. D.	38	S.	Dec. 16, 1896	Fibro-myoma; hæ- morrhage	Myomectomy.	"	
61	Dr. Laffan, Cashel	"	Dr. Cookman	"	M. O'C.	29	M.	Jan. 12, 1897	Solid ovarian; free ascites; umbilical hernia	Douched out with sal- ine; umbilical hernia dissected and secured by continuous purse- string sutures; tu- mour not malignant (Dr. McWeeney)	"	Erythema 5th day; vesti- calis; bullæ
62	Dr. Ledwith, Mullingar	"	"	"	M. C.	25	M.	Jan. 20, 1897	Double pyosalpinx	Right and left tube found overlapping behind uterus; dense adhesion; tumour burst, contents spilled; douched with hot saline	"	
63	—	"	"	"	M. S.	37	M.	Feb. 2, 1897	Appendicitis, with ovary and tube complications	Excision of appendix; tube and ovary left	"	
64	Dr. Martin, Sligo	"	"	"	M. C.	19	S.	Feb. 4, 1897	Solid ovarian	Sarcomatous (Dr. McWeeney)	"	Dr. Martin re- ports patient well
65	—	"	"	"	R. K.	26	S.	Feb. 11, 1897	Malignant disease of transverse colon	Exploratory	"	
66	Dr. Ryan, Bailieboro', Cavan	"	Dr. C. Moore	"	N. B.	19	S.	Feb. 11, 1897	Ovarian cystoma	—	"	
67	—	"	"	"	M. L.	42	M.	Feb. 12, 1897	Hernia in old suture track; op. in June, 1895, a panhyster- ectomy	Displacement method	"	

Table of Abdominal Sections—continued.

No.	Sent by	Assistant	Name	Age	W, S, M.	Date of Operation	Disease	Features of Operation	Result	Remarks
68	—	Dr. Devitt	M. D.	32	M.	Feb. 13, 1897	Solid ovarian	Large pedicle; tumour sarcomatous (Dr. McWeeney)	Recovery	Patient died from recur- rence nine months after operation
69	Dr. McEvoy, Blackrock	"	M. D.	38	S.	Feb. 16, 1897	Fibro-myoma	Exploratory; malig- nant; degeneration too fixed	"	Patient died some seven months after operation
70	—	"	M. N.	28	M.	Feb. 18, 1897	Ovarian cystoma	—	"	
71	—	Mr. Connolly	A. M. K.	26	M.	Mar. 4, 1897	Double pyosalpinx	Very dense adhesions; cyst did not burst	"	
72	Dr. McArdle	Dr. C. Moore	K. E.	30	S.	Mar. 10, 1897	Fixed backward dis- placement	Adhesions broken down; uterus sutured to ab- dominal wall.	"	
73	—	"	M. N.	23	S.	Mar. 11, 1897	Tubercular disease around caecum and right tube	Exploratory	"	
74	Dr. White, Tralee	Dr. Tobin	B. H.	21	S.	Mar. 22, 1897	Dermoid cyst of ovary; size sixth month pregnant uterus	—	"	
75	Dr. McArdle	Dr. C. Moore	M. O'H.	40	S.	Mar. 24, 1897	Broad ligament fibro-myoma	Enucleated	"	

76	Dr. Hickey, New Ross	-	Mr. Connolly	-	M. E.	31	M.	Mar. 30, 1897	Ovarian cystoma; size eighth month pregnant uterus	Many soft adhesions; cyst very slack	"	
77	Dr. M'Dermott	-	"	-	B. V.	20	S.	April 2, 1897	Double hæmatosal- pinx	Great difficulty in sepa- rating Fallopian tube, which burst; took ether very badly; in- testine accidentally caught in suture	"	
78	Dr. Baird, Blackhall-street	-	"	-	M. N.	39	W.	April 8, 1897	Ovarian cystoma	Cyst ruptured previous to operation; fine process-like chorionic villi over intestines	"	Patient re- tained Nov. 10, 1898; re- turn of tu- mour; ma- lignant
79	Dr. M'Kenna, Carrickmacross	-	Dr. C. Moore	-	A. W.	33	M.	Ap. 13, 1897	Ovarian cystoma; size of ninth month pregnant uterus	—	"	
80	Dr. M'Cauley Dunmore West, Sligo	-	"	-	B. K.	24	S.	Ap. 20, 1897	Ovarian cystoma; size of goose egg	Secondary hæmor- rhage; ligature slip- ped; douch, normal saline	"	
81	Dr. Rutherford, Manorhamilton	-	Mr. Connolly	-	M. C. G.	50	M.	Ap. 25, 1897	Ovarian cystoma; size seventh month pregnant uterus	—	"	
82	—	-	"	-	V. S.	40	M.	Ap. 23, 1897	Malignant disease of peritoneum	Exploratory	"	
83	Dr. Crane, Clonmel	-	Dr. C. Moore	-	M. W.	36	M.	May 2, 1897	Large dermoid cyst; size of sixth month pregnant uterus	Pedicle very broad; chain suture; cyst had teeth, hairs and bone plates	"	

Table of Abdominal Sections—continued.

No	Set by	Assistant	Name	Age	W. S. M.	Date of Operation	Di- c- t- i- o- n	Features of Operation	Result	Remarks
84	Dr. Graham, Limerick	Dr. C. Moore	M. T.	29	M.	May 9, 1897	Solid ovarian of left side; pyosalpinx on right side	Vermiform appendix adherent; much trouble from sutures cutting through pedi- cle.	Recovery	Abdominal fis- tula; pedicle sutures pas- sed through
85	Dr. Martin, Sligo	"	C. D.	24	S.	May 22, 1897	Large cystic ovarian; size seventh month pregnant uterus	Pedicle very small, several teeth	"	
86	Dr. O'Donnell, Pembroke-road	Dr. McArdle	M. S.	30	M.	May 22, 1897	Ruptured tubal preg- nancy	Left Fallopian tube, showing secondary rupture, removed; foetus and placenta found	"	
87	Dr. Dwyer, Tipperary.	Dr. C. Moore	M. S.	33	M.	June 5, 1897	Ovarian cystoma; size seventh month pregnant uterus	Cyst burst; sprouts coming through cap- sule; malignant pa- pilloma	"	Aortic regur- gitation
88	—	Dr. Chas. Kenny	M. M.	17	S.	June 11	Ovarian cystoma; size seventh month pregnant uterus	Dermoid	"	-
89	Dr. Sam. Gordon, Hume-street	Drs. McArdle and Tobin	M. O'M.	30	M.	June 12	Fibro-myoma	Double oöphorectomy	"	
90	—	Dr. C. Moore	M. C.	25	S.	June 22	Ovarian cystoma; size of goose egg	—	"	

91	Dr. O'Byrne, Derry	-	Drs. M'Ardle and Tobin	M. M. K.	18	S.	July 1, 1897	Ovarian cystoma; size fifth month pregnant uterus	-	-	"
92	Dr. Leahy, Cork	-	" "	M. L.	50	W.	July 15, 1897	Ovarian cystoma	-	Extensive adhesions; intestine opened; su- tured	"
93	-	-	Dr. M'Ardle	M. S.	38	S.	Oct. 19, 1897	Fibro-myoma	-	Panhysterectomy	"
94	Dr. Tobin	-	Dr. Tobin	N. D.	35	M.	Oct. 19, 1897	Fibro-myoma	-	Retro-peritoneal hys- terectomy; primary li- gation of uterine artery; bladder hard; suture passed through	"
95	Dr. Colohan, Galway	-	Drs. M'Ardle and Tobin	M. K.	38	S.	Oct. 22, 1897	Interstitial myoma	fibro-	Retro-peritoneal hys- terectomy	"
96	Dr. J. Dowling, Tipperary	-	Dr. Philip Murphy	M. M.	37	M.	Oct. 26, 1897	Fibro-myoma	-	Myomectomy	"
97	Dr. Costello, Tarbert	-	Dr. Philip Murphy	J. B.	38	M.	Oct. 30	Fibro-myoma	-	Enucleation	"
98	Dr. Wynne, Clonmel	-	" "	M. K.	30	S.	Nov. 2, 1897	Ovarian cystoma	-	Extensive adhesions	"
99	-	-	" "	M. L.	31	S.	Nov. 9, 1897	Fibro-myoma	-	Myomectomy	"
100	Dr. Nolan, Balbriggan	-	Drs. Tobin and Philip Murphy	M. E.	40	S.	Nov. 9	Fibro-cystic growing	part	Retro-peritoneal hys- terectomy; primary li- gation of uterine arteries; very collap- sed; saline douche	"

Gave birth to
full-term
child follow-
ing year

Table of Abdominal Sections—continued.

No.	Sent by	Assistant	Name	Age	W., S., M.	Date of Operation	Disease	Features of Operation	Result	Remarks
101	—	Dr. Philip Murphy	K. S.	18	S.	Nov. 12	Ovarian cystoma	—	Recovery	Acute bronchitis, temp. 103°
102	Drs. Smart and Beamish, Newry	Drs. Tobin and P. Murphy	B. L.	36	S.	Nov. 17	Fibro-myoma	Uterus and tumour rotated so as to amputate the cervix	"	
103	Dr. Kerin, Galway	Drs. M'Ardle and Tobin	S. S.	40	S.	Nov. 19	Fibro-myoma part growing	Retro-peritoneal hysterectomy	"	Abdomen reopened for suppurating suspected secondary hæmorrhage
104	Dr. Barry, Thurles	Dr. Philip Murphy	M. K.	40	M.	Nov. 30, 1897	Mesenteric cyst	Enucleated	"	
105	—	" "	M. C.	24	M.	Dec. 2, 1897	Ovarian cystoma	—	"	
106	—	" "	M. P.	43	S.	Dec. 14, 1897	Fibro-myoma	Myomec'omy	"	
107	Dr. J. Dowling, Tipperary	" "	M. H.	23	M.	Jan. 8, 1898	Retention of menstrual flow from acquired atresia	Exploratory to ascertain condition of tubes; found normal	"	Uterus opened per vagina
108	Dr. Crossle, Newry	Drs. M'Ardle and Tobin	M. O'S.	34	M.	Jan. 9, 1898	Ovarian cystoma	Fresh adhesions	"	
109	Dr. J. Dowling, -	Dr. P. Murphy	M. D.	23	M.	Jan. 10,	Tubal pregnancy	Removed before rup-		

110	Dr. Garret Hickey, New Ross	"	"	M. B.	40	M.	Jan. 28, 1898	Fibro-myoma rapidly growing	Double oöphorectomy - ectomy	"
111	—	Drs. Mc'Ardle and Tobin	S. I.	36	M.	Jan. 29, 1898	Fibro-myoma; pain- ful menstruation	Fibro-myoma; pain- ful menstruation	Double oöphorectomy -	"
112	—	Dr. P. Murphy	M. C.	38	M.	Feb. 4, 1898	Fibro-myoma	Fibro-myoma	Myomectomy	"
113	—	"	M. N.	34	S.	Feb. 11, 1898	Ovarian cystoma, solid	Ovarian cystoma,	—	"
114	Dr. Gerty, Loughrea	"	M. D.	24	S.	Feb. 15, 1898	Solid ovarian; free ascites	Solid ovarian; free ascites	B u d s protruding through capsule	"
115	Dr. Mc'Glaughlin, Derry	Dr. P. Murphy and Mr. Connolly	M. A.	39	M.	Feb. 21, 1898	Pregnant uterus, with enormous fibro-my- oma	Pregnant uterus, with enormous fibro-my- oma	Porro	Died
116	—	Dr. P. Murphy	N. H.	27	S.	Feb. 22, 1898	Hernia in old suture track	Hernia in old suture track	Displacement method	Recovery
117	—	"	N. B.	24	S.	Mar. 10, 1898	Fibro-myoma rapidly growing	Fibro-myoma rapidly growing	Retro-peritoneal hyster- ectomy	"
118	Dr. Mc'Quade, Ballyjamesduff	Drs. Mc'Ardle and Tobin	N. S.	30	M.	Mar. 12, 1898	Adhesion after abdo- minal section	Adhesion after abdo- minal section	Large piece of omentum removed	"
119	Dr. Mc'Cauley Ballina	Dr. P. Murphy	N. S.	54	M.	Ap. 24, 1898	Ovarian cystoma; size eighth month pregnant uterus	Ovarian cystoma; size eighth month pregnant uterus	Broad pedicle; chain suture	"
120	Dr. O'Connor, Celbridge	"	N. C.	48	M.	May 4, 1898	Ovarian cystoma; size of goose egg	Ovarian cystoma; size of goose egg	—	"

Table of Abdominal Sections—continued.

No.	Sent by	Assistant	Name	Age	W., S., M.	Date of Operation	Disease	Features of Operation	Result	Remarks
121	Dr. M'Ardle	Mr. E. White	M. H.	25	S.	May 9, 1898	Solid ovarian; enormous ascites; temp. 103° F.	Peritoneum all covered over with organised lymph	Recovery	Second operation
122	—	"	N. S.	32	M.	May 10, 1898	Ovarian cystoma	—	"	
123	—	"	P. T.	26	S.	May 17, 1898	Fibro-myoma	Myomectomy	"	
124	—	Dr. P. Murphy	K. G.	22	S.	May 20, 1898	Double pyosalpinx	Extensive adhesions	"	
125	Dr. Pye, Galway	Drs. M'Ardle and Tobin	N. S.	48	S.	May 28, 1898	Malignant disease—peritoneum	Exploratory	"	Died five months after operation
126	—	Dr. P. Murphy	M. W.	22	M.	May 28, 1898	Fibro-myoma	Myomectomy; retro-peritoneal hysterectomy	"	
127	—	"	K. L.	20	S.	June 7, 1898	Ovarian cystoma	—	"	
128	Dr. O'Kane, Derry	Drs. M'Ardle and Tobin	N. O'K.	54	M.	June 20, 1898	Ovarian cystoma	—	"	
129	—	"	M. M'G.	36	M.	June 21, 1898	Ovarian cystoma; size eighth month pregnant uterus	—	"	
130	—	Dr. P. Murphy	N. O.	34	M.	June 24	Double pyosalpinx	Extensive adhesions	—	

131	—	Mr. Hackett	S. T.	34	S.	Oct. 7, 1893	Hernia following operation seven years ago	Extensive hernia; sac dissected, edges freshened, interrupted silk sutures	"	Erythema
132	—	Drs. M'Ardle and Tobin	M. T.	44	M.	Oct. 8, 1893	Salpingo-ovariitis	Double salpingo-öophorectomy	"	"
133	Dr. O'Connor, Fethard	Mr. Hackett	M. H.	35	M.	Oct. 8, 1898	Fibro-myoma in anterior wall of uterus, low down	Enucleated by ant. colpotomy	"	Secondary hæmorrhage
134	—	" "	T. S.	28	S.	Oct. 13, 1898	Hernia in old incision	Displacement method	"	"
135	—	Drs. M'Ardle and Tobin	S. R.	40	S.	Oct. 13, 1898	Hydrosalpinx; extensive adhesions	Intestine damaged	Died	Ileus paralyticus
136	Dr. Griffin, Kilkenny	Mr. Hackett	K. C.	29	S.	Oct. 14, 1898	Double hydrosalpinx	Salpingectomy; ovaries left; extensive adhesions	Recovery	"
137	—	Drs. M'Ardle and Tobin	S. N.	32	S.	Oct. 16, 1893	Malignant disease of cæcum	Exploratory	"	"
138	Dr. Barry, Borrisokane	Mr. E. White	M. S.	50	M.	Oct. 18, 1893	Solid ovarian tumour; free ascites	Pedicle very broad; chain suture	"	Tumour balled
139	Dr. M'Hugh, Harcourt-street	Mr. Hackett	L. N.	34	S.	Oct. 21, 1898	Solid ovarian	—	"	Omental hernia
140	—	" "	M. H.	34	M.	Oct. 24, 1898	Tubal pregnancy	Vermiform appendix overlapping cyst; ulcerated; removed	"	"
141	Dr. C. Ryan, Tipperary	Drs. M'Ardle and Tobin	M. H.	36	M.	Oct. 25, 1898	Ovarian cystoma; size fourth month pregnant uterus	—	"	"

Table of Abdominal Sections—continued.

No.	Sent by	Assistant	Name	Age	W., S., M.	Date of Operation	Disease	Features of Operation	Result	Remarks
142	Dr. Tobin	Drs. Mc Ardle and Tobin	S. S.	36	S.	Oct. 28, 1898	Fibro-myoma	Double oöphorectomy	Recovery	
143	—	"	S. S.	28	S.	Oct. 29, 1898	Double salpingo-ovaritis	Double salpingo-oöphorectomy	"	
144	—	Mr. Hackett	N. R.	33	S.	Oct. 29, 1898	Intense dysmenorrhœa, unrelieved by repeated curettings or drugs	Double salpingo-oöphorectomy by anterior colpotomy	"	
145	—	"	M. K.	35	M.	Oct. 31, 1898	Adhesions after abdominal section	Separated	"	
146	—	"	M. L.	37	M.	Nov. 1, 1893	Adherent backward displacement	Separation by posterior colpotomy	"	
147	—	"	N. L.	50	M.	Nov. 2, 1898	Ovarian cystoma	—	"	
148	Dr. C. Ryan, Tipperary	Drs. Mc Ardle and Tobin	N. O'D.	28	M.	Nov. 4, 1893	Broad ligament cyst	Enucleated; great difficulty in forming a pedicle	"	Erythema
149	Dr. Kenny, Carrick-on-Suir	Mr. Hackett	A. M'G.	27	M.	Nov. 7, 1898	Adherent retroflexed uterus	Separation of adhesions by post. colpotomy	"	
150	—	"	M. L.	34	M.	Nov. 8, 1893	Prolapsed ovaries	Removed by posterior colpotomy	"	
151	—	"	M. M'G.	25	M.	Nov. 14, 1898	Ovarian cystoma	—	"	

Fibro-myomata.—As to the treatment of fibro-myomata I am not in a position to dogmatise, but I felt it my duty not to accept the simple fact of the presence of a tumour as a sufficient indication for operation. I must be satisfied that its continued presence is in some way or other a menace to life, or that its presence is incompatible with a comfortable existence. Each case was weighed on its merits, and I practised on each that particular method of operation which seemed to me to meet the requirements of the particular case. Consequently you will observe that I did not treat all cases alike. I performed enucleation twice, myomectomy six times, panhysterectomy twice, retro-peritoneal hysterectomy eight times, and double oöphorectomy three times—making in all 21 operations without a death.

Double Oöphorectomy.—Double oöphorectomy was at one time a fashionable treatment for fibro-myomata, and had many strong advocates. I never quite liked the operation; still I must confess that my own experience is favourable. I do not consider it an operation of election, but one of expediency. You can always proceed to the major operation later on should the case require it.

Myomectomy and Enucleation.—Myomectomy and enucleation are, in my opinion, the ideal conservative operations for fibro-myomata, but unfortunately the percentage of cases in which you can employ either operation is low indeed. The essence of either operation is the removal of the tumours with the preservation of the uterus, or at least as much of it as will allow of the proper performance of its physiological functions. The following case has a direct bearing on this subject:—

No. 96.—M. M., aged thirty-seven, married one and a half years, was sent up to me by Dr. J. Dowling, Tipperary, in Oct., 1897. She suffered from a very large fibro-myoma (a diagram of which is here shown). A large broad pedicle connected the tumour with the

uterus, and it seemed to be an extension from the left cornua of the uterus. I felt, although she suffered from no urgent symptoms, that if the patient became pregnant there would be no place for a viable child plus the tumour. I accordingly performed myomec-tomy. The left cornua of the uterus was cut well into by a wedge-shaped incision. This was brought together by interrupted silk sutures. The recovery was uninterrupted. On May 28th of this year I heard the patient had been again increasing in size, and it was feared there was a return of the tumour. However, on

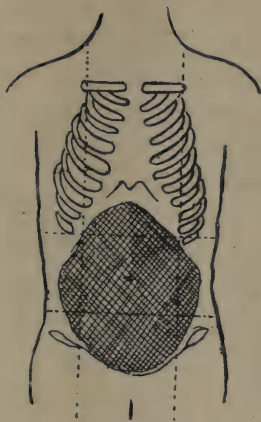


Fig. 1.

questioning her, she told me she had not seen her changes since Dec. 14th. On palpation a pregnant uterus up to the umbilicus was made out, and the foetal heart heard. The patient returned home, went on to full term, and gave birth to a strong, healthy male child. I have letters confirming this information from Dr. Russell, Raheen, Baasha, who attended her, and Dr. C. Ryan, Tipperary.

Retro-peritoneal Hysterectomy.—The operation of retro-peritoneal hysterectomy was performed eight times. In all cases the tumours were very large. I showed them from time to time at this Section of the Academy. All were operated on in the Trendelenburg position. The technique employed by me was based on the principle of primary ligation of the main arterial trunks supplying the uterus and the

appendages, thus reducing to a minimum the loss of blood. Before an incision is made, after exposing the tumour, the bladder is distended with creolin solution, to map out its boundaries. This I consider essential from the frequency with which I found the bladder drawn up by the tumour. Having satisfied myself as to the position of the bladder, I make an incision across the front of the anterior wall of the uterus, well above the utero-vesical fold, taking care not to go too deeply. I then with my fingers push off the bladder from the uterus. Traction is being made all the while by my assistant on the tumour, until I come to the junction of the portia-media and supra-vaginal portion of the cervix. I then feel for the uterine artery, and, having located its position, I clear it, pass a long aneurysm needle under it, and ligate it with stout silk. The same procedure is followed on the opposite side. Having ligated both uterine arteries, I feel for and ligate both ovarian arteries close to the brim. All this time the broad ligaments are intact. A flap of peritoneum is fashioned off the posterior wall of the uterus by incising a track from one broad ligament to another. The peritoneum is then peeled back and preserved; with scissors I snip down the broad ligaments on either side, leaving the tumour and uterus supported by the stripped cervix, which is then amputated by a modified wedge incision. The spilling of venous blood from the tumour is controlled by clamp forceps, thus preventing fouling of the parts and the blurring of your vision.

Treatment of Pedicle.—The upper portion of the mucous membrane in the cervical canal is dissected out, and the hole is swabbed with corrosive sublimate solution 1 in 1,000. I do not suture or bring together the surface of the stump, but the entire surface is completely covered over by accurate suturing of the large anterior and posterior flaps, leaving the pedicle completely retro-peritoneal. Interrupted silk sutures also bring together the layers of each broad ligament.

Panhysterectomy I performed twice. The technique is precisely that employed in retro-peritoneal hysterectomy up to the amputation of the cervix. Instead of amputation the vagina is opened into from above by cutting down on an instrument placed in the vagina to distend it. Having entered the vagina, the cervix is freed by clipping it with a

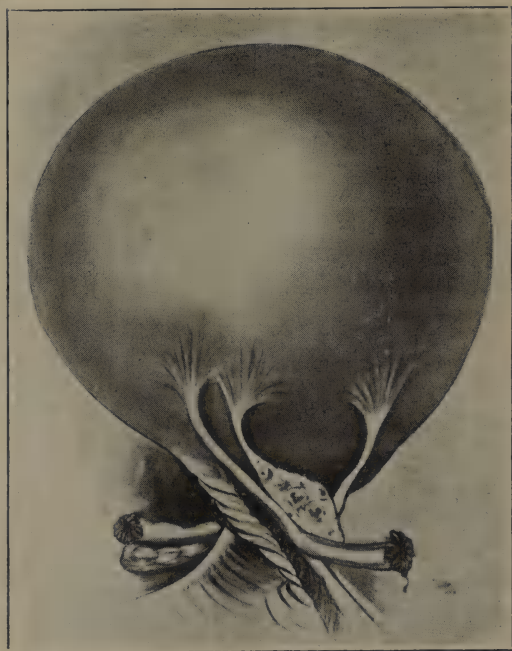


Fig. 2.

scissors under the guidance of the finger. The anterior and posterior flaps of peritoneum are united just as accurately as in retro-peritoneal hysterectomy.

The following case will, I think, be of interest as showing how nature sometimes effects a cure:—

CASE No. 102.—Drs. Beamish and Smartt, of Newry, sent me the patient in November, 1897. She had noticed a lump in her abdomen

for the past eight years, and she stated it got much larger within the past two years. It extended above the umbilicus, and filled out the flanks; it was very mobile. The sound could be passed only 2 cm., and the tumour palpated quite separate from the uterus. Assisted by Dr. Tobin and Mr. Philip Murphy I opened the abdomen; the tumour was easily drawn out, and it was much twisted around its pedicle from left to right—in fact, so completely



Fig. 3.

as to have amputated the cervix uteri through the portia-media; a thin, translucent layer of membrane alone held cervix and the remainder of the uterus together. This membrane was easily cut through; it contained no blood vessels. The pedicle left consisted of vaginal portion and a small part of the portia-media, and it was completely sealed over by fibrous tissue. The tumour consisted of the remainder of the uterus and a large fibro-myoma growing from the fundus, with the tubes and ovaries hanging quite free on either

side. This is the most perfect example of amputation by rotation I ever saw, and it is remarkable that there were no adhesions with surrounding structures. Some members may remember this unique specimen having been shown at this Section of the Academy. Fig. No. 2 represents the tumour twisted, and No. 3 untwisted.

Ventral Hernia.—In operating on small ventral hernia following operations I adopted a displacement method. The sac is isolated and incised; after exposing the contents, which are reduced, the sac is then loosened freely from its surrounding attachments. A second incision is made through the skin, superficial fascia and fat down to the muscular layer, about $1\frac{1}{2}$ inches from the edge of the wound. A forceps is pushed obliquely through the muscular wall, up to the peritoneum at the edge of the incision; the free ends of the sac are seized and drawn through. Interrupted silk sutures are passed through the skin, fat, muscular and aponeurotic layers.

With large hernia I find it necessary to excise the sac, freshen the edges freely, and suture with interrupted silk sutures. I hope in the near future to adopt a modification of the flap and displacement method for extensive cases of ventral hernia, the results of which I hope to place before you.

Ovarian Tumours.—Of the 39 ovarian tumours, 28 were cystic, 9 solid, and 2 dermoid; 13 were complicated and 26 simple. Some of the complicated cases gave considerable trouble in the separation of adherent intestine, and in the arrest of surface hæmorrhages. On many occasions I found it necessary to split the wall of the cyst, so as to free the intestine, and while splitting the cyst wall I was careful not to leave any of the cyst epithelium. All cases recovered.

The following case is an interesting one, as showing the secondary troubles of abdominal surgery:—

CASE 121.—M. H., aged twenty-five, the mother of two children, the younger five months old, was admitted to St. Vincent's Hospital

suffering from enormous distension of abdomen, which began to form after her last confinement. On May 4th of this year I opened abdomen, assisted by Mr. E. White. There was a great quantity of free ascites. I removed a solid ovarian tumour, size of fifth month pregnant uterus. The peritoneum was covered all over with organised lymph. About thirty hours after operation pulse ran up to 126, temperature 103.6° , and I was hurriedly sent for, as the patient had taken a change for the worse. I found abdomen much distended; percussion was resonant in the flanks, dull in the centre. Four grains of calomel, followed by mist. rosæ, and two turpentine enemata failed to move the bowels. I reopened abdomen; there was ascitic fluid partially encysted in the centre. The small intestines were not distended, but the cæcum was twisted on itself, distended like an inflated penny balloon; it was quite dark in colour, without lustre, and seemed on the point of bursting. A constricting band of organised lymph had bound it quite tightly. This I cut through between double ligatures. I was afraid to restore the cæcum. I brought it out through the abdominal wound, passed a bone pen-handle, previously sterilised by boiling, through the mesentery to act as a support, and stitched the cæcum to the abdominal wall. I opened it and irrigated bowel with saline solution. For several days the bowels moved regularly through the artificial anus, but if purgative medicine was given a considerable quantity passed per anum. The patient rapidly regained strength; she left hospital at the end of June; she returned early in last October. She had gained greatly in appearance—had put on flesh; in fact, one could hardly recognise her. The cæcum had retracted almost entirely, leaving only a very small fistula; the bowels, as a rule, move per anum, but occasionally, while lying in bed, fæces pass through the fistula-anus. I thought it safer to let sleeping dogs lie, so I sent her again to the country for a few more months in the hope that the fistula will close by natural efforts.

Tubal Pregnancy.—I had three cases of ruptured tubal pregnancy, and in one case (No. 109) I removed the distended tube before it ruptured. I have given full details of these cases elsewhere; I merely content myself with showing a photograph of specimen removed from Case 55—a splendid example of ruptured tube with fœtus. All cases did well.

Colpotomy.—Both anterior and posterior colpotomy were performed five times—once to enucleate a small fibro-myoma, once to perform double salpingo-oöphorectomy, and three times to separate adhesions in a backward displaced uterus. As an alternative route to the abdominal cavity it has its position in gynæcology, and certainly one cannot but be struck with the absence of shock and rapid convalescence. Nevertheless, the number of occasions in which I could perform the operation were few, and in one case I had con-



Fig. 4.

siderable trouble in arresting hæmorrhage, having to ligature both uterine arteries before controlling it properly.

Double Pyosalpinx.—Four cases were treated; in all the cases very extensive adhesions had to be dealt with. No. 62 burst during removal, but the peritoneum was well douched out; there was no bad result. Nos. 71, 124, and 130 I was fortunate to be able to get away without rupturing.

Appendicitis.—The vermiform appendix played an im-

portant part in Cases 63, 84, and 139. The following case is of greatest interest:—

No. 63 came to St. Ann's Ward at the end of Jan., 1897, and gave a history that she was confined on the floor before the arrival of either nurse or doctor. On the second day after confinement she got a rigor, and suffered great pain in the lower part of abdomen. She was treated with hot stupes and douching. I saw her five months after confinement, and palpation revealed a mass as in diagram. The bimanual under ether gave the impression of an ovarian abscess. Abdominal section revealed the tube and ovary

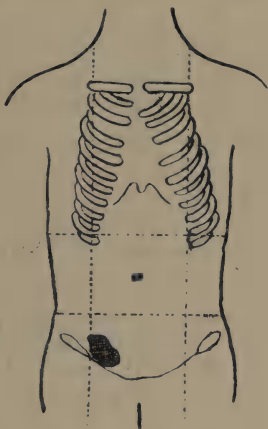


Fig. 5.

normal, but adherent to the ovary was the vermiform appendix, which was perforated, and was surrounded by a quantity of pus. I excised the appendix and left tube and ovary. On thinking over this case subsequently I never remember a case of either ovarian abscess or pyosalpinx which seemed to float so high in the pelvis. This case is interesting, from the history, as a cause of rise of temperature following a confinement, from the facts that both tube and ovary were normal and that the position of the tumour of the appendix was not classical.

Fatal Cases.—I regret very much to have to report two fatal cases, but it is a matter for congratulation that the sad

endings can in no way be attributable to negligence, or to a break-down in our aseptic system. I read the cases for you, you can judge for yourselves:—

FIRST CASE (No. 115).—A married woman, aged thirty-nine, no family, complained of a swelling in her abdomen for six years, but that latterly it grew very rapidly. She had seen no change for six months. The abdomen was greatly distended; the tumour pressed so much on the diaphragm as to cause dyspnoea; the patient had to be propped up in bed. The only treatment was to perform a Porro. The abdominal cavity was opened from ensiform cartilage to pubes, the tumour and uterus were turned out, and the entire mass was removed as in retro-peritoneal hysterectomy. Patient was progressing favourably, the bowels acted by enema—a good motion on the second day—pulse 80, temp. 99.2° at night. On the evening of the fourth day she complained of pain referred to left hypochondriac region. She said she felt distended and inclined to vomit. I unfortunately temporised, as the lower part of the abdomen was quite flat, pulse 100, aspect good. However, next morning the patient was very ill; regurgitative vomiting had set in. I reopened the abdomen, found a loop of the ileum distended, and a slough the size of a half-crown formed in its most distended portion. I drew out the loop, and formed an artificial anus. The patient sank and died the sixth day after operation.

SECOND CASE (No. 134).—This case was an operation undertaken to remove a hydrosalpinx. There were extensive adhesions, and there was considerable difficulty in separating the intestines. Patient seemed to be doing well, but the bowels would not move in response to ordinary remedies, and several enemata were given without benefit. Pulse 100, temp. 103° , tongue moist, aspect good, no nausea or vomiting, abdomen distended. Influenced by last case I reopened abdomen, assisted by Mr. M'Ardle. The ileum was greatly distended, quite pale in colour, no fluid in posterior *cul-de-sac* or flanks, or any trace of peritonitis. The loop of intestine that was separated from the tube was most carefully examined, fearing there might be some damage there; none was found. The entire loops were drawn out of abdomen on to a warm saline towel, and carefully examined, without result. The intestine seemed to have lost all power; there was not the slightest attempt at peristaltic movement. Patient died on the sixth day after operation. It is of interest to note the patient never suffered from either nausea or

vomiting; she took nourishment quite freely, and her aspect was always good. I put the cause of death down to ileus paralyticus for want of a better term.

In the case of death following the Porro operation, I could not for a long time explain the local sloughing of the intestine. I thought I must have squashed a knuckle of intestine against the tumour, or that I had inadvertently caught it in a ligature. But Professor Köcher, of Berne, in a recent number of the *British Medical Journal*, in describing local necrosis of the intestine, says:—"In the majority of my *post-mortem* examinations I found very important lesions in the wall of the intestine above the seat of obstruction. They consist in the formation of circumscribed necrosis of the mucous membrane going on to sharply circumscribed ulcerations through the whole thickness of the wall, and giving rise eventually to perforation. The cause of these ulcerations is not, as has been stated, due to the pressure of hard faecal masses pressing for some time on the same spot. You may find the same ulceration in the ileum and jejunum to a very great extent where the bowel is filled with liquid contents. The cause is the same as that which acts in cases of incarcerated hernia (as I have shown long ago) above the seat of incarceration, and the same you can produce artificially by over-distension of a part of the bowel by injection of gas or fluid. You will see that without the slightest interference with the mesenteric circulation the bowel gets quite blue by venous stasis. As a consequence of this ecchymoses may form in the mucous membrane, the nutrition is altered, and the protective influence of the epithelium, which has been proved to be of such importance, is destroyed, and the mischief is done. Absorption of bacteria and of the toxic products of faecal contents begin from that very moment, and if you do not step in in time, your patient will die either from general intoxication, with symptoms of weakness of the heart

and collapse, or he will die from local intoxication with necrosis of the mucous membrane (first at the places of the above-mentioned ecchymosis), going on to ulceration and perforation."

Secondary Operations.—Apart from the secondary operations detailed above, I reopened the abdomen in Case 80 for secondary hæmorrhage due to slipping of pedicle suture, and in Case 103, for exceptional circumstances. The operation was a retro-peritoneal hysterectomy, which was completed without a hitch. On the evening of the operation diarrhœa set in; as many as twelve fluid motions were passed inside of a few hours without pain or distress. Next morning patient began to vomit and yawn, toss her arms about restlessly; pulse 120, temperature 98°. On examination the abdomen was distended and quite tympanitic. Mr. Tobin and Mr. M'Ardle saw the case in consultation, and we deemed it advisable to reopen, the symptoms pointing to secondary hæmorrhage. On opening the abdomen nothing was found abnormal; there was no blood or trace of peritonitis. The abdomen was reclosed, and the patient made an uninterrupted recovery.

Erythema.—A peculiar erythematous rash, very much like measles, was observed in Cases 61, 132, and 148. The patients complained of a hot, prickling sensation under the skin; there was no rise of temperature or constitutional symptoms present. The rash was best marked on the wrists, buttocks, and chest in Case 61. Bullæ and large vesicles formed over the chest, and there was a general desquamation. The rash appeared about the fifth day, and disappeared about the tenth day.

Flushing the Peritoneum.—The peritoneum was flushed four times in Cases 55 and 62 for soiling of the peritoneum with suspicious cyst contents, in Cases 80 and 100

to restore collapsed patients: in 80 for bad secondary hæmorrhage, and in 100 after a difficult retro-peritoneal hysterectomy.

Drainage.—I did not consider it necessary to use a drain in any of the 100 cases.

General Preparation of Patient.—All cases except emergency ones are kept under observation some days before operation to investigate the condition of heart and kidneys, and to regulate the bowels. If they are anæmic and much run down, I administer iron and arsenic, and feed them up well. This course I consider essential, as the phagocytes are better able to resist infection and the convalescence is quicker.

Particular Preparation of Patient.—The entire body of the patient was cleansed by a bath or otherwise, as seemed most suitable. The skin of the region to be operated on was thoroughly scrubbed with monkey-brand soap and very hot water, shaved when necessary, then washed down with corrosive sublimate solution, and covered with a corrosive sublimate poultice. Immediately before operating the abdomen was washed with ether and then sponged with hot corrosive sublimate solution. Dry sterilised towels are spread over the chest and thighs of the patient as a further protection against the danger of infection.

Sterilising Hands.—The stages for sterilising the hands are as follows:—(1) Pare and cleanse nails with scissors. (2) Soften hands with a lather of soap, then scrub thoroughly with soap and hot water, paying special attention to folds of skin and nails and using aseptic nail-brush. (3) Immerse hands for two minutes in corrosive sublimate solution, 1 in 500, made tepid, and leave them wet. (4) Keep hands moist with the same solution during operation.

If I had been operating on a septic case, I follow the method of sterilisation of my hands which I learned as a student in Professor Billroth's clinic, Vienna—viz., after a thorough washing and scrubbing with soap and hot water, the

hands are immersed in a hot saturated solution of permanganate of potassium, until stained a deep mahogany colour, after which they are immersed at once in a saturated solution of oxalic acid, as hot as can be borne. This decolourises and completely sterilises them. I also use sterilised gauze gloves while operating after attending on a septic case.

Sterilisation.—The sister in charge of the ward, assisted by my staff-nurse, superintends every detail of sterilisation. Sterilisation of instruments likely to be required for operation is carried out by boiling them for five minutes immediately before the operation in a solution of 1 per cent. of carbonate of sodium in Schimmelbusche's apparatus. Silk is sterilised by boiling for half an hour in a 1 per cent. solution of carbonate of sodium; it is then placed on glass spools and kept in a bath of corrosive sublimate solution, 1 in 1,000, until required for use. Gauze sponges are used instead of sea-sponges; they are made up of eight layers of butter muslin stitched together at the margin (the usual size, 4 × 4 inches); all sponges, gauze dressings, towels, &c., are sterilised by being placed in Lantenschlager's steam steriliser for one hour at boiling point.

Suture of Abdominal Walls.—The abdominal walls are sutured by interrupted sutures, using fine silk No. 4, or silk-worm-gut, taking in the entire thickness of the wall. I use strong curved needles, and feel with my fingers that the aponeurosis is included; all sutures are removed on the eighth day. Stitch abscesses I never see since I employed more perfect methods of sterilisation. In tying the sutures I have been interesting myself as to the exact degree of tension to be employed, as I often thought I tied the sutures too tightly. I accordingly experimented somewhat, and tied loosely with the following result:—

CASE No. 138.—An easy, solid ovarian; I tied the sutures just tight enough to approximate the edges of the wound without any

strangulation of the tissues. On taking off the dressing on the eighth day to remove the stitches, I found two large protrusions of omentum between the first and second and second and third sutures (specimens here shown). The omentum had been a week outside the abdominal cavity, and had grown into the pad. Having examined carefully to exclude any knuckle of intestine, I transfixed them with silk and removed them, returning the stumps. I then refreshed the edges and resutured the openings. It will be interesting to note if there will be any hernia in the near future.

The Dressing.—The dressing employed is very simple. It consists of a sterilised pad of absorbent cotton, folded in a few layers of ordinary butter muslin, held in position by strips of rubber plaster, and over all a flannel binder.

After-treatment of Abdominal Section.—The usual practice is for patients to receive nothing but sips of hot water for the first forty-eight hours, then milk and weak tea. This practice is not followed slavishly, as frequent variations have to be made, the patients in some cases getting stimulants and Valentine's extract of beef as soon as they can take it.

Pain.—I employ codeina tabloids or phenacetin. Two tabloids of codeina, to be followed every second hour by one tabloid, frequently give much relief. Phenacetin is given in 10 gr. doses. I do not absolutely deprive patients of the soothing influence of morphin. I believe intestinal adhesions, if they are going to take place, form inside a few hours; consequently, if a patient suffers much pain—say 12 hours after operation—I give $\frac{1}{4}$ gr. morphin hypodermically.

Flatulence.—If not relieved by a turpentine enema or carminatives, I found it quickly benefited by touching the abdominal walls lightly with a Paquelin's cautery, especially where there is meteorismus.

Vomiting.—If the ordinary routine methods failed the stomach was washed out, and three cases of persistent ether vomiting were at once stopped by the patient drinking a copious draught of cold water.

Purgatives.—Purgatives are given the second morning after the operation; a saline mixture, such as *mist. rosæ* or *mist. sennæ co.*, is preferred. Sometimes calomel (3 grs.), to be followed by a Seidlitz powder, is selected. When the bowels did not act I ordered a turpentine enema.

Abdominal Belts.—I have given up for years the use of abdominal belts after abdominal sections; herniæ are best



Fig. 6.—Gynæcological Theatre, St. Vincent's Hospital. Installation for Abdominal Section.

prevented by proper suturing. An abdominal belt, to be of any use, must increase intra-abdominal pressure—an infallible way to find the weakest spot.

I have now, gentlemen, placed before you my work in abdominal surgery since May, 1896. Taking my first series of 50 cases and the present one of 100, I have performed 150 abdominal sections with only 2 deaths, or a mortality of 1·3 per cent. nearly.

DR. F. W. KIDD said that one remark with regard to the treatment of abdominal hysterectomy, and the advisability of distending the bladder, reminded him of an operation in which he dealt with a large tumour. The bladder was drawn up on this tumour half-

way to the umbilicus, and he tried to dissect off the bladder from the anterior surface of this tumour, but unfortunately in his case the bladder was collapsed, and he had not adopted the method mentioned by Dr. Smith—namely, distension. The result was that he perforated the bladder, but fortunately that did not militate against the recovery of the patient. Speaking of drainage, he thought that perhaps they were almost unanimous with regard to not leaving a drain of any kind in the abdominal cavity.

MR. TOBIN described how the surgeons of St. Vincent's Hospital had all arranged to operate in the same way, and if a change was to be made in any details the surgical staff met together and rejected or adopted the proposed change. He thought that this was an admirable arrangement for all concerned.

DR. MACAN said he would like to hear something further as to the four cases in which reference to the separation of adhesions was made. He had missed, as far as he remembered, any account of the separation of the adhesions, and of the indications which led to abdominal section. As to the hernia cases he said that he would treat them exactly as if they were abdominal sections. The question of sewing the abdominal wall *en masse*, or of sewing each of the layers separately together, was an important question, and he thought to simplify this by making through and through stitches, and then taking the coats separately, prevented hernia from forming. Speaking about the cases of appendicitis, he said he had received an extremely interesting paper from Dr. Edward, of New York, where he (Dr. Edward) said that it had been demonstrated that one could palpate the vermiform appendix in the usual bi-manual method with as much facility as one palpated an ovarian tumour for example. With reference to the administration of morphia after abdominal section, he (Dr. Macan) would always advocate its use.

DR. SMITH, in replying, said he was glad that Dr. Kidd recognised the value of distension of the bladder previous to abdominal operations. In reply to Dr. Macan, he said that if Dr. Macan would read the report of the cases he would see a tabulated list, and there also would be found the reasons why he undertook exploratory incisions, and also particulars referring to the separation of adhesions. Continuing, he said that if he were unable to satisfy himself as regards the exact nature of a tumour, he always explored the abdomen before operation. He thought Dr. Macan's suggestion—that when he sutured the abdomen through and through

he would then introduce a secondary suture and suture the aponeurosis—was a very valuable one. As regards palpation of the vermiform appendix, he (Dr. Smith) had made the relations of the vermiform appendix a special study, and as Dr. Macan's friend from America wanted to persuade him (Dr. Macan) that he could palpate the vermiform appendix in the normal situation, all he could say was that he hoped Dr. Macan did not believe his American friend. In concluding, Dr. Smith said he was in favour of the administration of morphia after abdominal operations.

CLINICAL REPORT OF THE GYNÆCOLOGICAL
DEPARTMENT OF THE ROTUNDA HOSPITAL,
FOR ONE YEAR, NOVEMBER 1ST, 1897, TO
OCTOBER 31ST, 1898.

By R. D. PUREFOY, F.R.C.S. (MASTER);

AND

R. P. R. LYLE and H. C. LLOYD (ASSISTANTS).

[Read in the Section of Obstetrics, March 17, 1899.]

THE general operative technique and subsequent treatment of this department were carried out on the principles described in our last report.

In certain cases of meteorism following ventral cœliotomy, in which the bowels refused to respond to aperients and turpentine enemata, we have found marked benefit from the use of the interrupted galvanic current. One pole is placed as high as possible in the rectum, while the other is passed over the surface of the abdomen, principally following the course of the large intestine. In every case in which this was used it was followed by almost immediate success; in only one case was it necessary to repeat it on a second occasion.

There were 31 patients in hospital on November 1st, 1897; 571 were admitted during the twelve months; 13 died, and 23 remained under treatment on 31st October, 1898. Of these patients 47 were discharged, refusing or not requiring special treatment; 11 were transferred to the Maternity Hospital; 24 were suffering from complaints not of a gynæcological nature.

TABLE I.—CASES.

DISEASES	Total Cases	Cured	Improved	Not Improved	Died	REMARKS
VULVA—						
Bartholinian abscess . . .	1	1	—	—	—	Incised, curetted, and plugged with iodoform gauze.
Epithelioma of clitoris . . .	1	—	—	1	—	Inoperable; involved urethra and anterior vaginal wall.
Kraurosis	1	1	—	—	—	Excised.
Ulcer	1	1	—	—	—	Simple, from injury.
Papilloma	3	3	—	—	—	Excised. In one case the papillomata were of considerable size.
PERINEUM—						
Abscess	1	1	—	—	—	
Lacerations, simple . . .	58	56	—	2	—	One refused operation; the other had purulent vaginitis, so the operation was deferred.
„ complete	7	7	—	—	—	
RECTUM—						
Carcinoma	1	—	—	1	—	Sent to a general hospital.
Hæmorrhoids	3	3	—	—	—	Excised.
Prolapse	1	1	—	—	—	Everted and cauterised (actual cautery.)
URETHRA AND BLADDER—						
Retention of urine . . .	1	1	—	—	—	Ninety ounces drawn off. Retroversion of 3½ months' gravid uterus.
Cystitis	1	1	—	—	—	Irrigation with boric lotion.
VAGINA—						
Absence of vagina . . .	1	—	—	1	—	Genital organs also absent. <i>Vide, infra</i> , Interesting Cases No. IV.
Cyst	1	1	—	—	—	Excised.
Cystocele only	5	4	—	1	—	This patient was four months pregnant.
Epithelioma	3	1	2	—	—	Two cases admitted only of palliative treatment.
Fistula, vesico-vaginal . .	1	1	—	—	—	Following confinement. Closed up without operation.
Kolpohyperplasia cystica .	1	—	1	—	—	
Rectocele	6	5	—	1	—	One refused operation.
Rectocele and cystocele . .	1	1	—	—	—	
Vaginitis	11	11	—	—	—	One case was treated with sulphate of copper solution.
„ senile	2	—	2	—	—	

TABLE I.—CASES—*con.*

DISEASES	Total Cases	Cured	Improved	Not Improved	Died	REMARKS
CERVIX—						
Carcinoma . . .	6	1	3	1	1	
Erosions . . .	14	11	3	—	—	
Hypertrophy . . .	5	5	—	—	—	
Lacerations . . .	29	26	—	3	—	
Cyst . . .	2	2	—	—	—	Excised.
Polypus . . .	2	2	—	—	—	
Specific ulceration . . .	1	—	1	—	—	Procidentia, ulceration of vagina and thighs.
CORPUS UTERI—						
Abortion, incomplete . . .	53	53	—	—	—	
„ threatened . . .	5	3	2	—	—	In three cases the uterus had to be emptied. Inoperable.
Carcinoma . . .	4	—	2	2	—	
Endometritis and metritis	84	—	84	—	—	
Fibro-myomata . . .	33	21	7	7	3	
Inversion, chronic . . .	1	1	—	—	—	
Latero-flexion . . .	2	—	2	—	—	
Pathological ante flexion	19	—	19	—	—	
Pregnancy . . .	10	—	—	—	—	
Polypus . . .	3	3	—	—	—	One fibrous, one placental, and one mucous.
Procidentia . . .	9	5	4	—	—	
Prolapse . . .	9	9	—	—	—	
Pyometra . . .	1	1	—	—	—	
Retroversion and retro-flexion	73	7	66	—	—	
Sarcoma . . .	1	1	—	—	—	
Subinvolution . . .	8	8	—	—	—	
FALLOPIAN TUBES—						
Hæmatosalpinx . . .	1	1	—	—	—	
Pyosalpinx . . .	12	11	—	1	—	One refused operation.

TABLE I.—CASES—*con.*

DISEASES	Total Cases	Cured	Improved	Not Improved	Died	REMARKS
FALLOPIAN TUBES— <i>con.</i>						
Salpingitis . . .	7	2	5	—	—	
Tubal pregnancy . .	3	2	—	—	1	
OVARIES—						
Cyst	40	30	3	6	1	
Dermoid	2	1	—	—	1	
Prolapse	17	—	—	17	—	
Sarcoma	1	1	—	—	—	
PELVIC PERITONEUM AND CELLULAR TISSUE—						
Abscess	2	—	2	—	—	
Broad ligament cyst .	3	1	—	2	—	Refused operation and were discharged.
Hæmatocele	3	1	2	—	—	
Parametritis	11	—	11	—	—	
Purulent peritonitis .	1	—	—	—	1	Admitted moribund.
ABDOMEN—						
Abscess	1	—	—	—	1	
Carcinoma	3	—	—	2	1	
Hernia	6	2	—	4	—	Two refused operation, one sent to a general hospital, one not suitable for operation.
Pyonephrosis	1	—	—	—	1	
Sinus	2	—	2	—	—	One of these subsequently recovered.
Tubercular kidney . .	1	—	—	—	1	
MISCELLANEOUS—						
Anæmia	2	—	2	—	—	
Chyluria	1	—	—	1	—	Sent to a general hospital.
Impaction of feces . .	1	1	—	—	—	
Mastitis	1	1	—	—	—	
Phthisis	1	—	1	—	—	
Phlegmasia	1	—	1	—	—	



PLATE I.—Chronic Inversion and Procidentia of the Uterus, due to a Submucous Myoma of the Fundus.

Fibro-myomata.—Seven of these cases were discharged without special treatment, some refusing operation, and others having trifling symptoms. Seven cases are recorded as improved. Of these, three with trifling symptoms were curetted; in two the operation was deferred, owing to the condition of the patients' general health; in one, which was associated with pyosalpinx and cystic ovary, ablation of the annexa was the operation performed; the seventh, in which both ovaries were cystic, was treated by double ovariectomy. There were eight cases of panhysterectomy with one death, four of supra-vaginal amputation with one death, five of myomectomy with one death; three cases were treated successfully by Doyen's morcellement, three others of sub-mucous myomata were treated by dilating the cervix with laminaria tents and removing the myomata piecemeal, and one very interesting case of chronic inversion of the uterus in an elderly woman due to a submucous myoma of fundus was treated by amputation of the corpus uteri. (Plate I.) In one case of panhysterectomy the patient was five months pregnant; the case will be described later.

Pyosalpinx.—One patient refused operation; of the eleven others, nine were treated by ventral salpingo-oöphorectomy, one by vaginal hysterectomy, and one by panhysterectomy. Three cases were tubercular. All these patients made good recoveries.

Ovarian Cystomata.—Twenty-one were removed by ventral ovariectomy with one death, four by anterior colpotomy, five in which the tubes were diseased by salpingo-oöphorectomy, three with trifling symptoms were curetted for endometritis, two were discharged without special treatment having no symptoms, three refused treatment, one was inoperable owing to the condition of the patient's general health, and one, a large

suppurating multilocular ovarian cyst, which filled the whole abdomen, the capsule being universally adherent, was drained through the abdominal wall and vagina; the patient made an excellent recovery.

TABLE II.—OPERATIONS.

Perineorrhaphy—

Lawson Tait's	-	-	-	56
Lawson Tait's (for complete rupture)	-	-	-	7
				—63

Anterior colporrhaphy	-	-	-	18
Colpo-perineorrhaphy	-	-	-	12
Emmet's trachelorrhaphy	-	-	-	21
Schröder's amputation of cervix	-	-	-	20
Schultze's treatment of adherent retroversion	-	-	-	2
Posterior division of the cervix (Dudley)	-	-	-	7
Marion Sims's operation for cervical carcinoma	-	-	-	4
Excision of papillomatous tumours from vulvæ	-	-	-	3
Excision of vaginal epithelioma	-	-	-	1
Alexander Adams's operation	-	-	-	1
Excision of hæmorrhoids	-	-	-	3
Amputation of inverted uterus (<i>vide</i> myomata)	-	-	-	1
Removal of submucous myomata (morcellation)	-	-	-	3

Vaginal cœliotomy—

Ovariectomy	-	-	-	4
Hysteropexy	-	-	-	3
„ and myomectomy	-	-	-	2
Ovariectomy and myomectomy	-	-	-	1
„ and hysteropexy	-	-	-	1
Posterior colpotomy	-	-	-	1
Hysterectomy	-	-	-	1
„ (morcellation)	-	-	-	3
				—16

Ventral cœliotomy—

Panhysterectomy	-	-	-	9
Supra-vaginal hysterectomy	-	-	-	6
Ovariectomy	-	-	-	21
Salpingo-oöphorectomy	-	-	-	19
Miscellaneous	-	-	-	12
Exploratory	-	-	-	5
				—72

TABLE III.—VAGINAL CÆLIOTOMY.

No.	Name	Age	Disease	Operation	Result	REMARKS
1	L. D.	28, M.	Ovarian cyst	Anterior colpotomy	Cured	Cyst very adherent, ruptured during manipulation. Patient examined subsequently; nothing abnormal could be felt.
2	E. A.	44, M.	Myoma uteri and retroflexion	Myomectomy and vaginal fixation	Cured	—
3	J. G.	28, M.	Ovarian cyst (left)	Ovariectomy	Cured	Patient has since been confined at full term.
4	K. T.	28, M.	Dermoid of ovary	Ovariectomy	Cured	Cyst of second ovary opened, scraped, and sutured.
5	M. T.	30, M.	Sarcoma of ovary	Ovariectomy and vaginal fixation	Cured	One ovary was removed, and on microscopic examination proved to be sarcomatous, the other ovary was therefore removed.
6	E. O'N.	33, M.	Prolapse	Vaginal fixation and colporthaphy	Cured	—
7	M. G.	32, M.	Procidencia	Ditto	Cured	—
8	M. M.	36, M.	Procidencia	Ditto	Cured	—
9	M. M.	34, M.	Retro-uterine suppurating tumour	Posterior colpotomy	Improved	Re-admitted several months later, and died of a large sarcoma, filling the abdomen, to be recorded in next report.
10	L. B.	30, M.	Ovarian cysts	Ovariectomy (double)	Cured	—
11	K. R.	35, M.	Ovarian cyst and myoma uteri	Ovariectomy and myomectomy	Cured	—
12	C. H.	36, M.	Myoma uteri and procidencia	Myomectomy and vaginal fixation	Cured	—
13	E. M'Q.	52, M.	Cervical carcinoma	Vaginal hysterectomy	Cured	—
14	A. R.	43, M.	Myomatous uterus and tubercular pyosalpinx	Vaginal hysterectomy morcellation	Cured	<i>Vide infra</i> , Interesting Cases No. III.
15	M. O'C.	40, M.	Myomatous uterus	Ditto	Cured	Elytrotomy.
16	B. T.	31, S.	Myomatous uterus	Ditto	Cured	—

VENTRAL CÆLIOTOMY.

TABLE IV.—HYSTERECTOMY.

No.	Name	Age	Disease	Result	REMARKS
1	J. S.	35, S.	Myomatous uterus	Cured	Panhysterectomy. Multiple myomata extending to umbilicus.
2	A. B.	36, S.	Myomatous uterus	Cured	Panhysterectomy. Multiple myomata extending to umbilicus.
3	M. M.	39, S.	Myomatous uterus	Cured	Panhysterectomy. Myoma size of a large orange, lying between vagina and rectum, and attached to cervix posteriorly.
4	M. A. D.	37, M.	Myoma uteri	Cured	Panhysterectomy. <i>Vide infra</i> , Interesting Cases, No. I.
5	R. C.	53, S.	Myoma uteri	Cured	Supra-vaginal amputation. Myoma size of seven months pregnancy.
6	M. W.	40, M.	Myoma uteri	Died	Panhysterectomy. Myoma extended to umbilicus.
7	B. T.	43, M.	Sarcomatous uterus	Cured	Supra-vaginal hysterectomy. Tumour weighed 12½ lbs.
8	A. C.	50, M.	Myoma uteri	Cured	Panhysterectomy.
9	J. M. C.	43, S.	Myoma uteri	Cured	Supra-vaginal amputation. Tumour extended to umbilicus.
10	M. B.	40, S.	Myoma uteri	Cured	Supra-vaginal amputation. Tumour size of seven months pregnancy.
11	M. G.	30, M.	Double pyosalpinx	Cured	Panhysterectomy.
12	M. G.	52, S.	Myomatous uterus	Cured	Panhysterectomy. Ovariectomy had been performed on a previous occasion, with only temporary relief.
13	N. K.	39, M.	Myomatous uterus	Died	Supra-vaginal hysterectomy.
14	N. K.	42, S.	Myomatous uterus	Cured	Panhysterectomy. Tumour extended to ensiform cartilage
15	A. H.	26, M.	Dermoid cyst	Died	Supra-vaginal hysterectomy. Cyst size of full-term pregnancy.

TABLE V.—OVIOTOMY.

No.	Name	Age	Disease	Operation	Result	REMARKS
1	J. G.	40, W.	Ovarian cyst	Right	Cured	Size of a large orange.
2	M. T.	26, M.	Ovarian cyst	Right	Cured	Size of a tennis ball, small cyst in left ovary punctured and evacuated.
3	L. B.	32, S.	Ovarian cyst	Right	Cured	Size of an orange; adherent to rectum posteriorly.
4	E. B.	52, M.	Ovarian fibro-cyst	Double	Cured	Size of a full term uterus; about one quarter of tumour was solid.
5	L. C.	25, S.	Ovarian cyst	Right	Cured	Left removed 2½ years previously; cyst size of an orange.
6	K. F.	23, M.	Ovarian cyst	Left	Died	Acute sepsis.
7	J. W.	30, S.	Ovarian cyst	Left	Cured	Large multilocular cyst, extending to ensiform; abdominal circumference, 37½ inches.
8	M. R.	40, M.	Ovarian cyst	Double	Cured	<i>Vide infra</i> , Interesting cases No. II.
9	M. D.	42, M.	Ovarian cyst	Right	Cured	
10	M. W.	29, S.	Left cystic ovary, and right cirrhotic	Double	Cured	
11	M. M.	30, S.	Ovarian cysts	Double	Cured	One, size of a cocoanut.
12	M. N.	23, S.	Ovarian cyst	Left	Cured	Size of a billiard ball.
13	M. F.	33, M.	Ovarian blood cyst	Right	Cured	Size of an orange.
14	A. D.	48, M.	Ovarian blood cyst	Right	Cured	Larger than full term pregnancy; multilocular, containing 8½ pints fluid; solid part weighed 5¼ lbs.
15	K. K.	38, M.	Cystic ovaries	Double	Improved	Myomatous uterus.
16	M. C.	38, M.	Ovarian cyst and cystic ovary	Double	Cured	Cyst size of full term pregnancy.
17	S. C.	25, M.	Ovarian cyst	Left	Cured	Cyst larger than full term pregnancy; cyst contained 22 pints fluid, and solid part weighed 4 lbs.
18	K. B.	23, M.	Ovarian cyst	Left	Cured	
19	M. A.	26, S.	Ovarian cyst	Left	Improved	Large solid ovarian tumour and ascites (tubercular).
20	E. H.	45, M.	Ovarian cyst	Right	Cured	Size of full term pregnancy.
21	F. B.	36, M.	Blood cyst of ovary	Left	Cured	Size of fetal head.

TABLE VI.—SALPINGO-OÖPHORECTOMY.

No.	Name	Age	Disease	Operation	Result	REMARKS
1	M. A. H.	35, M.	Pyosalpinx	Double	Cured	Omentum adherent in Douglas's space, and had to be ligatured.
2	M. W.	39, M.	Pyosalpinx	Right	Cured	Tubo-ovarian abscess in Douglas's space, uterus forming anterior wall of abscess cavity.
3	C. L.	22, M.	Cystic ovaries and salpingitis	Double	Cured	Ovaries size of a billiard ball.
4	E. B.	28, M.	Ruptured tubal pregnancy	Left	Cured	Tumour size of an orange, rupture felt by bimanual examination. History of six weeks pregnancy. There was also a cystic ovary.
5	E. L.	34, M.	Pyosalpinx and right cystic ovary	Double	Cured	Left tube adherent to large intestine. There was a myoma in anterior uterine wall.
6	C. W.	28, M.	Ruptured hæmato-salpinx	Left	Cured	Tube had ruptured between the layers of the broad ligament.
7	A. L.	27, M.	Pyosalpinx	Double	Cured	Left tube size of an orange.
8	M. W.	22, M.	Pyosalpinx	Double	Cured	Right ovary firmly adherent, and not removed.
9	M. A. Q.	34, M.	Pyosalpinx	Left	Cured	Small cyst on right ovary dissected out.
10	E. D.	34, M.	Hæmatocele	Left	Cured	
11	A. T.	36, M.	Ovarian cyst	Right	Cured	
12	J. G.	24, M.	Salpingitis and cystic ovary	Double	Cured	Left ovary not removed.
13	M. C.	29, M.	Pyosalpinx	Left	Cured	Tubercular.
14	M. B.	28, M.	Ovarian blood cyst	Right	Cured	Ovary size of small orange.
15	E. H.	33, M.	Pyosalpinx	Double	Cured	Tubercular.
16	K. C.	38, M.	Tubal pregnancy	Left	Died	Cardiac failure, secondary to long-standing mitral disease. <i>Vide infra.</i>
17	M. M.	28, M.	Ruptured tubal pregnancy	Right	Cured	
18	R. S.	28, M.	Left ovarian cyst and pyosalpinx	Left	Cured	
19	K. L.	27, M.	Left ovarian cyst and salpingitis	Left	Cured	

TABLE VII.—MISCELLANEOUS.

No.	Name	Age	Disease or Condition	Result	REMARKS
1	M. K.	26, M.	Cyst in broad ligament	Cured	Cyst size of a large orange. Patient four months pregnant. Confined in hospital at full term.
2	M. M.	31, M.	Pyonephrosis	Died	Nephrectomy.
3	K. M.	34, M.	Myoma uteri	Cured	Myomectomy.
4	B. S.	30, M.	Pelvic abscess	Improved	Vaginal and ventral coeliotomy.
5	A. N.	23, M.	Tubercular kidney	Died	Nephrectomy.
6	A. J.	25, M.	Abdominal abscess	Improved	At sciss evacuated; afterwards drained through vagina.
7	M. W.	18, S.	Retroflexion	Cured	Ventral fixation.
8	M. N.	33, M.	Umbilical hernia	Cure 1	Herniotomy. Patient four months pregnant; since delivered.
9	M. C.	29, S.	Fixed retroflexion	--	Coeliotomy. Dense adhesions; could not be broken down.
10	M. O'B.	36, S.	Myoma uteri	Died	Myomectomy. Extended to ensiform cartilage.
11	M. D.	47, M.	Multilocular suppurating ovarian cyst	Improved	Opened and drained. Universally adherent; filled the whole abdomen; drained through abdominal wall and vagina.
12	R. M.	47, M.	Ventral hernia	Cured	<i>Vide infra</i> , Interesting Cases No. V.

TABLE VIII.—EXPLORATORY.

No	Name	Age	Disease	REMARKS
1	M. D.	38, W.	Suppurative parametritis	Of old standing, universal firm adhesions, drained through abdominal wall.
2	K. S.	35, M.	Intestinal and omental adhesions	Ascending colon; small intestine and omentum matted together.
3	K. B.	35, M.	Ditto	Adhesions broken down.
4	M. M. B.	26, M.	Perimetritis	—
5	D. C.	66, M.	Abdominal carcinosis	Tumour adherent in abdomen; peritoneum thickly studded with growths.



PLASE II.—Pregnant Uterus with a Myoma occupying its lower half, removed by Panhysterectomy. The Infant had Hare-lip and Cleft Palate.

INTERESTING CASES.

CASE I.—M. A. D. (Case 4, Table IV.), aged thirty-seven, 5-para, admitted February 16th, 1898. She was treated in the hospital the previous May for profuse hæmorrhage, following an abortion. There was then a myoma about the size of an orange felt bulging into the anterior fornix. The hæmorrhage was so severe that the uterus had to be plugged, and next day the remains of an incomplete abortion came away. For five months after discharge she menstruated regularly, and she sought admission on account of crampy pains in the abdomen, fearing she was going to have a miscarriage. On examination the uterus, with history of four months' pregnancy, was found to reach three finger breadths above the umbilicus. The fœtus could be palpated and auscultated above a solid mass which occupied the lower half of the uterus. The fœtus lay in the transverse. A panhysterectomy was performed in the usual manner, and the abdominal walls closed by a single row of interrupted sutures. These were removed on the eighth day, and during the night, while coughing, the patient felt the abdominal wall give way. On examining the abdomen it was found that the omentum and some of the intestines were lying among the dressings. They were cleaned, and returned as soon as possible, and the wound again closed. The stitches were allowed to remain *in situ* for fourteen days, and the wound was then perfectly healed. Convalescence was uneventful. Patient has been seen twelve months subsequent, and is in excellent health. The fibro-myoma occupied the whole lower portion of the tumour, and the cervical canal skirted round the myoma, and was about 5 inches long. (Plate II.)

CASE II.—There was a history of an abdominal swelling, noticed first by the patient five months previous to admission. Three months after it was noticed she sought advice, and a cyst was diagnosed, and she was kept under observation for two months, during which time the cyst was tapped on three occasions, when 2, 5, and 6½ pints respectively were drawn off. The swelling soon increased again, and on admission she was very emaciated; her breathing was laboured, and there was an abdominal swelling which gave her a measurement at the level of the umbilicus of 48 inches. She was tapped, and 308 ounces of clear fluid withdrawn, and two days later the abdomen was opened, when about two quarts of ascitic fluid escaped. A large

cyst was then exposed and opened, letting out a quantity of thin fluid and flaky lymph. The cyst was then withdrawn and its pedicle from the right side of the uterus ligatured. On the left side a cyst extended nearly to the umbilicus. It was very friable, and its walls ruptured in manipulation, allowing the escape of a quantity of blood. The pedicle was ligatured and it was then removed. Its omentum was very œdematous and lay in Douglas's pouch. The cavity was filled with saline solution and the wound closed. The patient quickly rallied and convalescence was rapid. She left hospital in good condition.

CASE III.—A. R. (No. 14, Table III.), aged forty-three, 3-para, was admitted on July 14th, 1898, on account of constant pelvic pain, and pain on defæcation and micturition, with loss of weight and epigastric pain. There was a tumour, irregular in shape, hard, and nodular, intimately connected with the uterus, and filling up Douglas's space. The uterus was antiposed, and there was some thickening in the left broad ligament. The right ovary was enlarged and fixed. The uterus and appendages were removed by vaginal morcellation, and some abscess cavities in Douglas's pouch evacuated and scraped. Convalescence was uneventful, and patient left hospital four weeks after operation. Though there was nothing at the time of operation to indicate malignancy, we have heard that this patient has since died apparently of carcinoma. There was no microscopical examination made.

CASE IV.—E. C., aged twenty, married eighteen months, sought advice on account of amenorrhœa. She had never menstruated, but suffered at times from pain in the breast and side, with some distention of the abdomen. She also complained of flushings. She was fairly well developed. On examination under an anæsthetic it was found that the vagina was entirely absent, being represented by a furrow running down from below the symphysis, and having a pocket or dimple at its lower end about half an inch deep. By rectal examination neither uterus nor appendages could be felt; there was a longitudinal fibrous band which seemed to take the place of the uterus.

CASE V.—M. D., aged forty-seven, 1-para, was suffering from a large fibro-cystic swelling occupying nearly the whole abdomen, and which she had only noticed three weeks previously. She had also profuse hæmorrhagic discharge, headache, and retching. The sound passed the whole length, and did not reach the fundus.

When the abdomen was opened a large cyst presented. It was so intimately connected to its surroundings that it could not be removed. It was, therefore, tapped, and about 5 pints of pus escaped. Several smaller cysts were opened from this cavity. These cysts extended down to Douglas's pouch, and were firmly connected to the uterus. A counter-opening was made through the vagina, and the whole cavity washed out with formalin solution 10 per cent., and plugged with iodoform gauze. Throughout the operation the intestines were never seen. The patient remained in hospital for two months, the cavity contracting slowly. Shortly after the operation her mental condition became affected, but this passed off, and she increased in weight very considerably, and all her symptoms disappeared. The cavity was still in existence in the right hypochondrium on discharge, but there was no escape of any kind from it, the walls being smooth and hard, and feeling like a piece of tanned leather.

DEATHS.

CASE I.—This patient was operated on towards the close of our last year, and the operation of vaginal hysterectomy for cervical epithelioma is included in our last year's report. The death occurred six days after operation, and on *post-mortem* examination the edges of the broad ligament where the clamps had been applied were found to have sloughed, though there was no hæmorrhage. The kidneys were contracted and granular.

CASE II.—Was admitted moribund and refused any operative interference. The uterus was felt lying in front of a soft, boggy mass, which filled Douglas's pouch and extended upwards to the brim of the pelvis; next morning the pulse could not be felt, and on auscultating the apex 180 beats were counted per minute, respirations 40. She died 24 hours after admission. *Post-mortem* examination showed that the pelvis was full of thin pus, bound into this region by a thickened and adherent omentum. The right tube was distended with thin pus to the size of a coil of small intestine; its outer extremity formed an abscess cavity adherent to the pelvic wall, and no trace of the ovary could be found. The left tube was curled backwards and lay with the ovary in Douglas's pouch. It had a large, pulpy red granulation projecting from its extremity, and a similar polypoid mass was found at its uterine extremity and inside the uterine cavity. The peritoneum

was acutely congested. There had been no pregnancy for eight years, but an indefinite history of abortion at the fifth week ten days before admission.

CASE III.—A chronically inflamed ovary and thickened tube were removed from this patient by laparotomy. It had formed adhesions to the pelvic wall, and there was a knuckle of small intestine also adherent. After the operation vomiting was continuous and nothing could control it. The bowels were well moved on the third day, and urine passed in good quantity. She was fed by nutrient enemata and freely stimulated; nevertheless, she sank and died on the fourth day.

CASE IV.—Died ten days after removal of right kidney. There was a continual escape of a milky fluid which excoriated the skin. Great quantities of this escaped, and patient sank and died. No *post-mortem* examination was obtainable.

CASE V.—Patient a good deal collapsed after operation. There was great difficulty in getting the bowels to move, and no satisfactory motion was passed till the sixth day. She seemed very low and was despondent. The temperature remained below 101° F. until the seventh day, when she showed signs of collapse with quick rise of pulse and temperature. The lowest portion of the wound was opened and some pus escaped. The abdomen was washed out with saline solution, but she died shortly after. The abdominal cavity proved to contain a quantity of thin pus, and there were recent adhesions of intestines.

CASE VI.—Was admitted with temperature of 102° F., and pulse 110. She was unmarried, but a history of pregnancy was obtained. The uterus was enlarged, and was incorporated with a somewhat firm mass which occupied Douglas's space, and rose upwards half way to the umbilicus, pressing on to the rectum and bulging on to the posterior fornix. The cervix was patulous, and the breasts contained milk. She was too low for operation and died on the second day. There was a large abdominal abscess.

CASE VII.—Temperature and pulse continued to rise steadily after operation, and patient died on sixth day. The kidney contained many foci of pus, which revealed tubercle bacilli.

CASE VIII.—There was a slight rise of temperature on the second day, but it fell at once and remained throughout below 100° F. The pulse was very fast, and the bowels refused to

respond to aperients. She died on the fifth morning of cardiac failure. There was long-standing mitral disease.

CASE IX.—Died of syncope before examination. No *post-mortem* examination was obtainable. The administration of chloroform had just commenced.

CASE X.—A myoma weighing 8 lbs. was removed from the uterus by myomectomy. There was no difficulty in the operation. The appendages were removed from the right side; patient died next day. There was a good deal of shock after operation.

CASE XI.—This patient had a malignant abdominal swelling of some years standing which had gradually increased: there was advanced cardiac disease and a want of compensation, so no operation was possible. She died in hospital a few days after admission.

CASE XII.—This patient was admitted in a very emaciated condition with a large cystic tumour filling the abdomen, pressing downwards into the vagina and obliterating the fornices, and pressing the uterus against the symphysis. It proved to be a multilocular cyst. One of the loculi contained a ball of hair and some teeth. The cyst and uterus were removed leaving the cervix, and before closing the incision the abdominal cavity was flushed with saline solution. The operation was prolonged owing to the number of adhesions which had to be broken down, and patient was very collapsed at its conclusion, no pulse being obtainable at the wrist, and the carotids faintly pulsating at 120. Death occurred on the fifth day. The abdominal wound had healed, the rectum was bound over to the right side of the pelvis by old adhesions, there was some pus encysted between the abdominal wall and the ascending colon, and a slough on the cut surface of the cervix. The kidneys were small, pale, and cirrhotic.

CASE XIII.—A supra-vaginal amputation of the uterus, which contained several interstitial myomata, was performed, both ovaries being left; death occurred on the fifth day. There was no appearance of peritonitis; the kidneys were granular with adherent capsules; some flakes of lymph were seen on the intestines, and a loop was adherent behind the wound.

TABLE IX.—DEATHS.

No.	Name	Age	Disease	Operation	Cause of Death
1	M. M'C.	43	Carcinoma of cervix .	Vaginal hysterectomy .	Sapraemia and renal disease
2	B. F.	31	General septic peritonitis .	None .	Septic peritonitis
3	K. F.	29	Ovarian cyst .	Ovariectomy .	Acute sepsis
4	M. M.	31	Pyonephrosis .	Nephrectomy .	Inanition
5	M. W.	40	Myoma uteri .	Panhysterectomy .	Septic peritonitis
6	L. M.	25	Suppurative parametritis .	None .	Septic peritonitis
7	A. N.	23	Tubercular nephritis .	Nephrectomy .	Septic peritonitis
8	K. C.	33	Ectopic gestation .	Salpingo-öophorectomy .	Cardiac failure
9	M. N.	31	—	—	Syncope
10	M. O'B.	36	Myoma uteri .	Myomectomy .	Cardiac failure
11	E. E.	53	Abdominal carcinoma .	—	Cardiac failure
12	A. H.	26	Multilocular dermoid .	Ovariectomy and amputation of uterus	Chronic Bright's disease
13	N. K.	39	Myoma uteri .	Supra-vaginal amputation .	Acute sepsis



PLATE III.—A Case of Hernia of long standing which returned to the abdomen on manipulation. Patient afterwards refused operation.

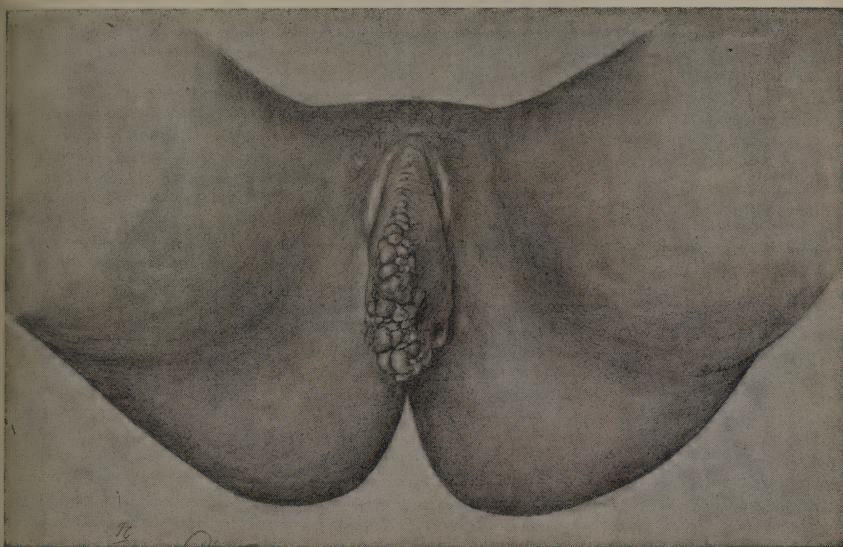


PLATE IV.—Case of Papillomata of the Vulva.

DR. MORE MADDEN said the record was most creditable. He believed this was due to the strict asepsis practised in the hospital. Dr. Purefoy had set a good example in the use of ergot in *post-partum* hæmorrhage. Though it was an old-fashioned treatment it was most effective.

DR. W. J. SMYLY thought it was a very great gain to have done away with the plug in the treatment of abortion. In the treatment of placenta prævia the same method was used at present as during his tenure of office at the Rotunda Hospital, when there was not one death as the result of hæmorrhage from placenta prævia, though two cases had ended fatally. One of these patients had been delivered by the old method of version and immediate delivery, and had died after a short time from hæmorrhage and rupture of the cervix, and the other had died on the 10th day of pulmonary embolism. Coming to accidental hæmorrhage, he considered that the best treatment was still practised—namely, that if the patient had not strong labour pains it was a mistake to rupture the membranes, and if there was external hæmorrhage the uterus should be plugged. In London, students taught at the Rotunda had been rejected at examinations for not saying that they would rupture the membranes in such cases. Even the nurses who go up for the examination of the Obstetrical Society were instructed beforehand to say, if asked what they would do in a case of accidental hæmorrhage, that they would rupture the membranes, which, he thought, would be most improper. He objected to the use of the expression “the induction of artificial abortion” in the report, as the term had a considerable amount of opprobrium attached to it, and he considered that it would be better to say that they accelerated abortion.

DR. MACAN pointed out that the mortality of the internal department was, contrary to what they would expect, twice that of the external department. He deprecated the time limit of four hours as an indication for the application of the forceps, as given in the report. Indications on the part of the mother or child were admissible, but the time indication was ridiculous. He concurred with Dr. Smyly in objecting to the expression “the induction of artificial abortion.” He noticed a case of eclampsia which was stated to be absolutely free from albuminuria, and therefore not capable of being explained by the ordinary theories. There was a case of brow presentation above the brim where the forceps had been

applied. He thought that the forceps was contra-indicated in such a case.

DR. KIDD referred to the fact that in about 50 per cent. of the cases of rise of temperature after delivery no explanation of the cause of this rise could be given. Surely they did not return to the old idea that it was due to milk fever, and that the poison was not of sufficient intensity to exhibit itself in the vaginal discharge.

DR. PUREFOY, Master of the Rotunda, in reply said that, with regard to the use of ergot in *post-partum* hæmorrhage, it was needless to say that they used it only when the placenta was absent. They employed Squibb's preparation of ergot, and he commended its use as it had given satisfactory results. One possible explanation of the fact that the mortality was greater in the internal than in the external department was, of course, that the bad cases in the external maternity were admitted into the hospital. The four hour limit was only one and the least important indication in the use of the forceps. The other indications on the part of the mother and the child were also taken into account. He agreed that it was unsatisfactory not to be able to assign a cause to the cases of rise of temperature which Dr. Kidd had referred to, but the fact remained that they were unable to give a tangible cause for the elevation, as a large number were not interfered with, even to the extent of a vaginal examination.

CLINICAL REPORT OF THE ROTUNDA LYING- IN HOSPITAL, FOR ONE YEAR, NOVEMBER 1ST, 1897, TO OCTOBER 31ST, 1898.

By R. D. PUREFOY, F.R.C.S. (MASTER);

AND

R. P. R. LYLE, and H. C. LLOYD (ASSISTANTS).

[Read in the Section of Obstetrics, February 10, 1899.]

DURING the twelve months comprised in this Report 1,840 women were admitted to the maternity department, 1,513 were confined, and 327 were discharged not in labour.

TABLE NO. I.—*Admissions to Maternity Department, 1897–98.*

—	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Total
Total number of Deliveries (child viable) -	105	129	128	113	122	131	111	121	125	110	124	115	1,434
Ditto (child non-viable) -	4	3	1	5	3	0	4	3	2	5	3	5	38
Abortions -	1	4	5	6	2	2	6	4	1	2	4	4	41
Total cases treated	...	...	...	...	...	...	...	...	...	...	...	...	1,513
Patients admitted, but discharged not in labour -	30	21	38	21	24	29	31	28	22	31	30	22	327
Total admissions	140	157	172	145	151	162	152	156	150	148	161	146	1,840

TABLE NO. II.—*Dispensary for Out-door Patients.*

Number of First Attendances	Number of Repeated Attendances
4,223	4,990

TABLE NO. III.—*Showing Number and Nature of Cases Treated in the Extern Maternity, 1897–98.*

Total number of cases	-	2,129	Mortality, maternal	-	7
Abortions	-	275	Multiple pregnancies—		
Chorea	-	1	Twins—		
Deformed pelvis	-	2	Females	-	6
			Males	-	13
Hæmorrhage—			Male and Female	-	15
Accidental	-	12			34
Placenta prævia	-	8	Triplets—		
Post-partum	-	29	All males	-	2
		49	Operations—		
Hæmatoma vulvæ	-	2	Curetting for		
Hydramnios	-	3	abortion	-	78
			Forceps	-	31
Infantile conditions—			Paracentesis		
Anencephalus	-	6	capitis	-	1
Hydrocephalus			Placentæ re-		
and spina bi-			moved manu-		
fida	-	1	ally	-	27
		7	Version	-	9
Moles—					146
Vesicular	-	1	Presentations—		
Carneous	-	1	Breech	-	65
		2	Brow	-	1
Mortality, infantile (born			Face	-	5
dead)—			Footling	-	13
Macerated	-	14	Occipito-posterior	-	13
Non-viable	-	24	Shoulder	-	1
Premature	-	18	Transverse	-	6
Putrid	-	2			104
Recent	-	45	Prolapse of funis	-	7
		103	Rupture of uterus	-	1

INTERESTING CASES IN EXTERN MATERNITY.

CASE I.—M. Q., aged thirty-five, 1-para; delivered November 2, 1897. *Concealed accidental hæmorrhage.* When seen patient was collapsed, pulse 160, scarcely perceptible, and showed all the symptoms of severe internal hæmorrhage; there was no external hæmorrhage. The uterus was greatly distended and painful on palpation; the vertex was presenting, but the os did not admit the finger. Porro's operation was performed, the patient being too collapsed to move into the hospital; a large quantity of blood was found free in the uterus, with the placenta entirely detached. The patient rallied somewhat after the operation. The following morning she was transfused with saline solution, but died the next day.

CASE II.—M. K., aged thirty, 3-para; delivered November 1, 1897. *Generally contracted pelvis.* Labour was induced in the hospital by Krauze's method. Labour pains supervened, and expelled the bougies, after which the pains ceased. She left the hospital against advice, and was delivered the following day in the Extern Maternity. The child was alive.

CASE III.—Mrs. F., aged twenty-nine, 9th pregnancy. *Triplets.* Six months pregnant. The first two were born as breech presentations, the third being a vertex; all three were males. There were two placenta. The infants lived for only a short time after birth. There was a family history of multiple pregnancies, though this was the first occasion on which the patient had had more than one at a birth.

CASE IV.—M. B., aged thirty-nine, 10th pregnancy. There was nothing of interest in this case beyond the fact that the placenta was retained for $2\frac{1}{2}$ hours, and then readily expressed. The patient had, however, given birth to twins on three occasions, and once had three at a birth; one of the triplets still lives and five of the twin children.

CASE V.—M. A. M'G., aged twenty, 2nd pregnancy. *Chorea.* Was seen by various students at frequent intervals during the previous two months. She, on each occasion, refused to come into the hospital. She had very pronounced chorea; so violent were the movements that she could scarcely get food to her mouth. She delivered herself, at term, of a living child, and soon after delivery the movements began to abate.

CASE VI.—M. W., aged thirty-two, 5th pregnancy. *Triplets.* First child born as breech presentation, its placenta following it in 15 minutes; the second, also a breech, and the third, a vertex. These two had a common placenta; they were all males, the first being stillborn. The mother was seen five months later, when one child was still alive and well.

CASE VII.—M. W., aged thirty. *Paracentesis capitis.* Breech presentation and hydrocephalus. In this case the child, a female, was delivered as far as the neck, when it was found that the uterus contained an enormous head. This was punctured behind the ear, and a very large quantity of fluid escaped, delivery then being easy. The child had also a spina bifida.

EXTERN MATERNITY—ACCOUNT OF DEATHS.

CASE I.—M. Q., aged thirty-five, 13-para. *Concealed accidental hæmorrhage*. Porro's operation. Reported under "Interesting Cases," *q.v.*

CASE II.—M. J., aged twenty-three, 4-para. *Post-partum hæmorrhage*. Patient was attended by a "handy woman," who sent to the hospital for assistance two hours subsequent to delivery of the child. During this time the patient had been bleeding freely, and when seen was nearly exsanguine and pulseless. The placenta was adherent and had to be removed manually, but the patient died a few minutes later.

CASE III.—M. M'E., aged forty-six, 6-para. *Probable rupture of the uterus*. Sudden death undelivered; no autopsy obtainable. Patient had all the symptoms of rupture of the uterus, with severe internal hæmorrhage. She was at full time. There was a history of short but very violent labour, with pains suddenly ceasing and slight external hæmorrhage, followed by collapse.

CASE IV.—M. T., aged thirty-three, 8-para. *Placenta prævia lateralis*. This patient died of severe hæmorrhage caused by the above condition on the arrival of the Extern Assistant.

CASE V.—M. D., aged thirty-five; 11th pregnancy. *Septic pneumonia*. Shortly after this patient was seen she discharged an apoplectic ovum from the uterus. This was the size of a hen's egg and had exceedingly thick walls. At this time her temperature was 105° F., and pulse 120. The temperature continued high notwithstanding daily douching and plugging with iodoform gauze. On the sixth day she had pneumonic signs, with marked jaundice, and on the eleventh she died. The spleen and liver were both enlarged on palpation.

CASE VI.—L. D. *Hemiplegia*. Had been treated for some time before delivery by dispensary doctor for right hemiplegia and loss of speech. She had incontinence of fæces. Delivery was normal, and the child was born alive. There was no rise of temperature or pulse during puerperium, but on sixth day she had several epileptiform seizures, and died shortly afterwards.

CASE VII.—B. D., 10th pregnancy. *Phthisis*. This patient had been confined to her bed for two months, and was in advanced phthisis, both lungs being much affected; she had been under treatment by the dispensary doctor. She died on the third day after confinement; the child was alive.

TABLE NO. IV.—*Showing Number and Nature of Cases Treated in the Intern Maternity, 1897–98.*

Total number of cases	-	1,513	Mortality, maternal	-	6
Primiparae	-	537	Multiple pregnancies—		
Abortions	-	41	Twins—		
Deformed pelvis	-	5	Females	-	9
Eclampsia	-	2	Males	-	7
Hæmorrhage—			Male and female		13
Accidental	-	6			29
Placenta prævia	-	5	Myomata	-	2
Post-partum	-	19	Operations—		
		30	Artificial abortion	-	6
Hæmatoma vulvæ	-	3	Cæsarean section	-	2
Hydramnios	-	11	Forceps	-	57
Hyperemesis	-	1	Induction of pre-		
Infantile conditions—			mature labour	-	3
Anencephalus	-	5	Paracentesis		
Hydrocephalus	-	3	capitis	-	2
Hydroencephalocele	-	1	Craniotomy	-	3
Ophthalmia	-	5	Placentæ, manual		
Procidentia uteri	-	1	removal of	-	18
Spina bifida and			Version	-	11
talipes	-	3			102
		18	Phlebitis	-	2
Insanity—			Presentations—		
Mania	-	8	Breech	-	62
Melancholia	-	1	Brow	-	3
		9	Face	-	6
Miscarriage	-	38	Hand and head	-	2
Morbidity	-	158	Occipito-posterior	-	28
Mortality, infantile (born			Transverse and		
dead)—			oblique	-	7
Macerated	-	29			108
Non-viable	-	26	Prolapse of funis	-	17
Premature	-	13			
Putrid	-	2			
Recent	-	42			
		112			
Do., died in hospital	-	35			

ABORTIONS.

There were 41 cases of abortion admitted during the year. Some of these required no special treatment; only those in which the hæmorrhage was severe, or in which any part of the ovum was still retained, were interfered with. In all these cases the treatment adopted was the emptying of the uterus—if possible by expression of the contents. This failing, and the os being sufficiently dilated, the ovum was

removed by the finger, or if the latter condition was not fulfilled, by Rheinstädter's curette.

The percentage of abortion in the Intern Maternity is extremely low compared to that in the Extern, owing to the fact that patients suffering from hæmorrhage in the early months of pregnancy usually remain in their own homes, and send to the hospital for assistance.

One patient was admitted with a temperature of $101\cdot6^{\circ}$ F. A decomposing ovum was detached and expressed; shortly afterwards she had a rigor lasting ten minutes, and three hours subsequently the temperature was $102\cdot4^{\circ}$ F. Next morning it was $98\cdot6^{\circ}$ F., and remained normal throughout the puerperium. Another had a myoma the size of a fist on the left side of the fundus, and this probably was the cause of the abortion.

In a third case, after the remains of a recent abortion had been removed with a Rheinstädter's curette, it was found that the uterus was still abnormally large, while the curette gave the sensation that the uterus was not empty. A sharp curette was used, and a considerable quantity of organised blood-clot and old decidual tissue were removed from the posterior wall. There was another case similar to this.

MISCARRIAGE.

There were 38 cases of termination of pregnancy between the third and sixth months, one of which was twins; and in six the gestation was terminated artificially. Two-thirds of the total number were pelvic presentations.

In six cases the child was born alive, but died a few minutes afterwards; in eight the child was macerated; and the remainder—a few of which were expelled with the membranes intact—were stillborn. In one case (M. B.) there was placenta prævia, in another (W. P.) accidental hæmorrhage; they are recorded respectively under these headings. One case of hydramnios will be described later.

ECLAMPSIA.

There were two cases of eclampsia treated during the year.

CASE I.—M. J. S., aged twenty-four, 1-para; seven months pregnant. Had general anasarca, and the urine, which was scanty, turned almost solid on boiling. Prior to being seen she had had seven eclamptic fits, she was then given half a grain of sulphate of morphia hypodermically, and was removed to hospital. On her way to hospital she had another fit. On her arrival she was given two drops of croton oil. In the next six hours, during which she had seven fits without regaining consciousness, another half grain of morphia was administered. During the next three hours she had two fits, and got a quarter of a grain of morphia, and two simple enemata, both of which were retained. One hour after the last hypodermic of morphia she had another fit; the chest was dry-cupped behind and the steam-pack employed. This caused her to perspire profusely. Some hours later, labour supervened, and she was delivered with the forceps of a dead child as soon as she came into the second stage.

Next morning, after being unconscious for thirty hours, she became semi-conscious, and passed $\frac{3}{4}$ vi. of urine. She was given calomel and mist. sennæ co. Later on her bowels moved freely, and she passed $\frac{3}{4}$ xiv. of albuminous urine.

Two days later she developed puerperal mania, was very restless and excitable, suffered from hallucinations, and refused to take any food. It was found necessary to feed her with a soft œsophageal tube. The mania lasted only three days; it gradually disappeared; she became convalescent, and was discharged well on the 13th day.

Her temperature and pulse, both of which were normal on admission, rapidly rose during the fits, and are recorded as 104° F. and 156 respectively one hour after the last eclamptic fit. They both fell to normal on the morning of the third day, but rapidly rose again with the mania, and reached 103° F. and 140 on the morning of the fifth day. Next day they dropped to normal, and remained so throughout the puerperium. She has since been seen several times in perfect health.

CASE II.—M. M., aged twenty-eight, 1-para; full time pregnancy. Patient got an eclamptic seizure lasting three minutes while in the second stage. The urine was highly albuminous. Forceps were applied, and the child, weighing 8 lbs., delivered alive. Six hours

later she had another fit, followed in half an hour by a third. Two drops of croton oil were then given. An hour later, as she had another fit, half a grain of sulphate of morphia was given hypodermically. As she had only one other fit shortly after the hypodermic, the morphia was not continued. She made a good recovery, and was discharged well on the eighth day.

TABLE NO. V.—*Accidental Hæmorrhage.*

Name	Variety	Treatment	Result to Child	Remarks
C. W.	Concealed	No interference	D.	No symptoms; retro-placental clots
B. R.	"	"	D.	" "
B. N.	Apparent	Version	D.	Detailed under hydro-cephalus
M. H.	Concealed	Plug and binder	D.	Delivered herself
B. C.	"	No interference	D.	Retro-placental clots
W. P.	"	Plug and binder	D.	Delivered herself

Two of these were mild cases without symptoms, the condition only being found on delivery by the placenta, with a quantity of coagulated blood, coming away immediately after birth of the dead fœtus. One had considerable distension of the uterus, and a slight escape of blood *ante-partum*.

The two others are as follow :—

CASE I.—M. H., aged twenty-two, 3-para ; admitted August 9th from Extern Maternity ; 7 months pregnant, with history of sudden and very severe abdominal pain, with vomiting and fainting. There was very slight external hæmorrhage. The uterus was nearly up to the ensiform cartilage, was very tense, and palpation gave patient great pain. The fœtus could not be felt. On vaginal examination the membranes were unruptured, os the size of a florin, and vertex presenting. Patient was in a condition of collapse; the pulse was scarcely preceptible at the wrist, and was 135 per minute. The vagina was carefully douched and tightly plugged with boiled cotton wool plugs, and an abdominal binder applied. Hot drinks and whiskey were administered by the mouth, and one hour later

good pains came on, partly forcing the plugs from the vagina. On removing them the patient expelled a dead fœtus, which was immediately followed by the placenta, and about $1\frac{1}{2}$ pints of dark-coloured blood, and a quantity of clots. The uterus contracted well, and convalescence was uneventful.

CASE II.—W. P., aged thirty-four, 13-para; admitted August 19th; 6 months pregnant, with a history of severe abdominal pain, vomiting and fainting, coming on while she was lying in bed. There was very slight external hæmorrhage on one occasion only. The condition was almost similar to that of M. H., with pulse of 132. She became more collapsed after admission—had sighing respirations, tossing her arms about, and became cold all over. Similar treatment was pursued, and, as she improved considerably, morphia $\frac{1}{4}$ gr. was given hypodermically 4 hours later. She then slept for $5\frac{1}{2}$ hours, waking occasionally to take nourishment. At the end of this time good pains came on, and she expelled the plugs, which were followed by the fœtus and placenta, with two enormous blood-clots lying behind it. Her temperature the same evening was 103° F. Next day it was normal, and remained so throughout.

TABLE NO. VI.—*Placenta Prævia.*

Name	Variety	Result to Child	Presentation	Period of Pregnancy	Treatment and Remarks
M. B.	Marginalis	D.	Footling	6 months	Ruptured the membranes and traction on the foot
E. R.	Lateralis	A.	Vertex	Full time	Patient in labour; ruptured the membranes
K. L.	Marginalis	A.	Occipito-posterior	Full time	" "
M. K.	Lateralis	A.	Face	Full time	Internal version, and foot brought down
L. M.	Lateralis	A.	Vertex	Full time	Bi-polar version and foot brought down

In every case convalescence was normal.

POST-PARTUM HÆMORRHAGE.

There were nineteen cases of post-partum hæmorrhage, ten of which were mild. Two of these were caused by retained portions of membranes, the others by atony of

the uterus. They were treated by removing the cause, hot douching, ergot, and massage. One only had a temperature; it did not exceed $101\cdot2^{\circ}$ F., was normal on the fourth day, and remained so. In three forceps had been applied. One was a case of twins, another followed placenta prævia. Four of the severe cases were due to adherent portions of placenta, which were removed manually; the remainder were due to atony of the uterus. In these the treatment was hot uterine douching, massage, and ergot. There were two cases of secondary hæmorrhage—one occurring on the second day after delivery, the other on the fifth day.

HÆMATOMATA.

CASE I.—M. M'C., aged twenty-six, 2nd pregnancy; admitted to gynæcological department with history of discharge of dark-coloured blood from vagina a week before. She had a mass of knotted varicose veins protruding from the vulva occupying the posterior vaginal wall. It had a base about 3 inches long; the surface was about to break down. From the rectum a depression was felt at the back of the mass. It was dissected off, and a quantity of blood-clot displaced from behind. The raw surface was stitched with continuous catgut suture. Fourteen days later labour came on, and in the birth of the child the wound opened. It was stitched up after confinement and healed up excellently. This was a case of polypoid hæmatoma, as described by Ahlfeld.

CASE II.—R. B., aged twenty-three, 1st pregnancy; was delivered in the Extern Maternity. Labour was normal. An hour afterwards she began to feel some pain in the left labium. On examination this was found to be distended by blood-clot to the size of a small coconut, black and glossy in surface at its lower portion. The swelling was opened in hospital under an anæsthetic, and a blood-clot as large as a fist was removed and the surface stitched with interrupted silkworm-gut sutures. The result was excellent, and the patient went out well on the 20th day.

CASE III.—E. W., aged twenty-one, 1st pregnancy; after twelve hours labour some hæmorrhage was observed, and on examination it was found that there was a tear in the posterior vaginal wall reaching

to, but not involving, the perineum, the foetal head being about $1\frac{1}{2}$ inches from the outlet. There suddenly appeared a swelling extending rapidly from near the right anterior margin of the anus into the labium of the same side. Forceps were applied and delivery effected, after which the lacerations and cavity from which the blood was evacuated were stitched up with silkworm-gut sutures. Puerperium was uneventful, and result good.

HYDRAMNIOS.

In the eleven cases of hydramnios there were one brow and two face presentations. In seven of the cases the membranes had to be ruptured artificially. Of the children four were anencephalic, one had spina bifida with talipes varus, and another, although it lived three hours, was macerated. Two of the mothers were admitted in a very debilitated condition, and improved rapidly during their stay in hospital. One had a pulse of 130, and temperature 102° F. on the evening of admission, with venous thrombosis of the right leg; the foetus, besides being anencephalic, was macerated. Her temperature ranged between 100° F. and 102.6° F. for the first six days in hospital, when it fell to normal, and continued so until the 21st day, when she was discharged well.

The other, six months pregnant, had a pulse of 134 on admission, and was greatly emaciated. Her temperature, however, was normal. The membranes were ruptured, and fifteen measured pints of fluid escaped. The foetus, besides being anencephalic, had cleft palate, hare-lip, spina bifida, and apparently no cervical vertebræ—it weighed $2\frac{3}{4}$ lbs. The puerperium was uneventful, and she was discharged well on the 8th day.

HYPEREMESIS.

CASE.—A. M., aged twenty-eight, 2nd pregnancy; admitted March 26th. This was the only case of this condition occurring in the practice of the hospital during the year, and we regret to

have to record it as a death. She was about eight months pregnant, and was admitted in an extremely emaciated condition and moribund, with a history of continued vomiting for the previous two months. She also stated that there had been no movement of the bowels for four weeks. Her temperature was 97.6°F , and pulse 104, hardly perceptible. On examination the foetal heart was heard on the left side, and the head was engaged in the pelvis. Soon after, on the onset of labour pains, the foetal heart ceased, and as soon as she came into the second stage forceps were applied and delivery effected, the child being dead. She lingered on until the next day, taking small quantities of fluid nourishment, and then died. The lower bowel contained no faeces, and there was no result from the enema which she got on admission. She was transfused with five pints of 1 per cent. saline solution intravenously, and though this gave rise to some improvement in condition it was only very transient. The autopsy showed the stomach much dilated, the intestines empty, and the kidneys large, soft, and fatty.

TWINS.

There were 29 twin births. In one case the second child was transverse, the hand, foot, and cord prolapsed; delivery was effected by traction on the foot, and pushing up the head. In another case a hand of the second child was prolapsed past its head; it was left to nature. A third case is reported under "Forceps." The presentations were—

Both vertex	-	-	-	14
Vertex and breech	-	-	-	7
Breech and vertex	-	-	-	5
Both breeches	-	-	-	1
Vertex and transverse	-	-	-	1
Vertex, vertex and hand	-	-	-	1

ARTIFICIAL ABORTION.

There were six cases of artificial abortion during the year, the patients being pregnant for periods varying from three and a half to six months, and suffering from repeated hæmorrhages.

In every case laminaria tents were used, and the vagina plugged with boiled cotton wool, the wool and tents being removed when the patient came into labour, which usually occurred within twelve hours.

In two cases the fœtus was extracted piecemeal by Schultze's spoon forceps on account of insufficient dilatation of the cervix. In four cases the placenta was adherent, and had to be removed with the fingers. Three of these cases were plugged with iodoform gauze on account of hæmorrhage subsequent to removal of the placenta.

In every case convalescence was normal.

CÆSAREAN SECTION.

CASE I.—M. C., aged thirty, 1st pregnancy; admitted on October 4th from Extern Maternity, from which she was sent in for pelvic contraction. She had been in labour for four and a half hours. She was only 4 feet 4 inches in height, and was much deformed. There was considerable prominence of the chest, marked lordosis, curved femora, 9 inches long, and twisted, bayonet-shaped tibiæ.

On vaginal examination the conjugate was found to be much contracted, the promontory so high above the symphysis as to give the impression that there was a displacement of one or two lumbar vertebræ. On measuring with Skutsch's pelvimeter it was found that the true conjugate was only $6\frac{1}{2}$ cm. (or $2\frac{1}{2}$ ins.), and the transverse $9\frac{2}{3}$ cms. The os was the size of half a crown, and the membranes unruptured. The head had not engaged.

The abdomen was opened, the uterus drawn forward and opened by a longitudinal incision, and the child extracted alive with some difficulty. The placenta and membranes were withdrawn, and the uterine wound closed by means of interrupted silk sutures, which passed through the entire thickness of the uterine wall. The abdominal wall was closed by silkworm-gut sutures, including all three layers.

The pulse, which was 100 on admission, commenced to rise immediately after the operation, and on the first evening was 120, with temperature of 99.4° F. A vaginal douche was given next day; the temperature was still below 100° F. On the third evening, the temperature rising to 102° , a uterine douche was given

with difficulty, owing to the prominence of the promontory, above and at the back of which the uterus lay, and some *débris* was washed away. The next day, as the thermometer registered 102.6° F., uterus was again douched and plugged with iodoform gauze, and this was continued twice daily throughout. On the 10th day she began to complain of cough, and the examination of the chest revealed rhonchi on both sides. Poultices were applied, and the signs on the right side disappeared, though crepitations were heard at the left base; breathing was frequent and expectoration free. On the 18th day she had a slight shivering, temperature ranging between 98.6° F., and 101° F., and pulse 130 to 156. Next day there were bubbling râles at the left base, extending a considerable way towards the apex and rhonchi on the right side; the heart was beating tumultuously at about 156 beats per minute. The expectoration was black and very foul. From this the temperature ran steadily up and reached 104.6° F. on the 20th day, when she died, the pulse being 164.

The *post-mortem* showed that the stitches in the uterine wall had sloughed out, and there was a collection of about ziii. of pus encysted between the uterus and the abdominal wall, to which it was adherent. The finger could be passed through the wound in the uterus and out at the cervix, yet there was at no time any discharge of pus through the uterus. There was no sign of peritonitis. The liver was much enlarged and very friable. The base of the left lung contained two large abscesses full of thin, foul-smelling pus. The abdominal wound had healed perfectly.

CASE II.—J. D., aged twenty-four, 1st pregnancy; admitted June 11th. A history of a drinking bout, followed by severe headache, preceding onset of labour pains at full time. There was then vomiting and loss of speech, with a condition verging on coma. On admission, the right pupil was dilated and insensible to light, the left being contracted and reacting. There was nystagmus in this eye. No paralysis of the limbs was evident. The temperature was 101° F., and pulse 156, the action of the heart being very violent. There were no labour pains, and after an enema containing chloral and pot. brom., she became quiet, but gradually passed into an unconscious condition, with laboured breathing, which gradually ceased. The abdomen was opened as soon as the patient was found to be dead and the child extracted, but no effort could resuscitate it. It weighed 8 lbs. *Post-mortem* examination showed acute suppurative meningitis. There was a quantity of pus over the occipital lobes.

TABLE No. VII.

Application of Forceps.

Indication		Dead Children	Remarks on Dead Children
Delay in 2nd stage over four hours* -	35	4	One child was macerated; in two, though no foetal heart was heard for some time previously, forceps had to be applied on behalf of the mother.
Threatened death of foetus -	6	2	
Rise in maternal temperature and pulse -	4	1	No foetal heart heard on admission.
Delay with pelvic contraction -	1	1	
Prolapse of funis -	4	4	Three admitted with funis prolapsed.
Hyperemesis -	1	1	
Eclampsia -	2	1	Seven months' foetus.
Convulsions (with anuria) -	1	—	
Mania acuta -	1	—	
Hæmatoma vulvæ -	1	—	
Threatened rupture of uterus -	1	—	
Total -	57	14	

* There were two occipito-posterior positions.

SUB-TABLE A.

Applications of Forceps.

I.-para. -	48	VI.-para. -	2
II.-para. -	2	VII.-para. -	1
III.-para. -	1	XIV.-para. -	1
IV.-para. -	2		
		Total -	57

SUB-TABLE B.
Ages of Primiparæ.

17-25	-	-	21
26-30	-	-	20
31-35	-	-	6
36-45	-	-	1

The percentage application of forceps in the Extern Maternity was 1·67 per cent., and in the Intern 3·97 per cent. This great difference is most probably due to the fact that the proportion of primiparæ to multiparæ is far greater in the Intern Maternity than in the Extern.

In one case the forceps were applied to the second of twins, as the head remained in the brim for five hours, and the child commenced to show signs of distress. Delivery was easy and the child alive.

In another case the patient had an epileptiform seizure as she came into the second stage. She passed no urine during the day, and the bladder was empty; an hour later she had another seizure, when it was considered necessary to apply the forceps. After delivery she was given half a drachm of bromide of potassium and 15 grains of chloral hydrate, after which she slept for nineteen hours. On awakening the catheter was passed, and 36 ounces of pale urine of low specific gravity, and containing no albumen, were drawn off; a few hours later 19 ounces were drawn off. Convalescence was normal.

One patient—a 6-para, aged twenty-eight—was admitted in a very excited state. She was considerably under the influence of alcohol, and during the pains, which were frequent, she strained violently. On examination the os was found fully dilated, head barely engaged in the brim and her pulse 120; the foetal heart was irregular. She had a history of forceps on all her previous confinements. Forceps were applied, and the child, weighing 6½ lbs., delivered alive with

some difficulty. The pulse remained rapid and feeble for three hours after delivery, and as she continued restless and excitable, she was given $\frac{1}{4}$ gr. of morphia hypodermically. She became maniacal soon after delivery, but it passed off on the ninth day, and she was discharged well on the eleventh. The temperature fluctuated between 99° F. and 100° F., and on one occasion reached 101° F.

INDUCTION OF PREMATURE LABOUR AND DEFORMED PELVIS.

There were five cases of deformed pelvis, in three of which labour was induced.

CASE I.—M. C., aged thirty, 5-para; four previous children, all stillborn. Pelvis measured $3\frac{1}{2}$ inches in the true conjugate, and $4\frac{1}{2}$ inches in the transverse diameter. Müller's method was tried, and, as the head would not descend, it was decided to induce labour by Krauze's method; the membranes, however, ruptured in the passing of the bougies. Next day, as labour did not commence, the bougies were removed, bipolar version performed, and a foot brought down. Four and a half hours later the child, weighing 5 lbs., was born alive; the head was delivered by Smellie's method the patient being in Walcher's position.

CASE II.—E. C., aged thirty-three, 10-para; 8 months pregnant; nine previous children were all stillborn. Pelvis measured $3\frac{3}{10}$ inches in the true conjugate. Krauze's method was tried twice unsuccessfully. On the third occasion three bougies were passed, five laminaria tents were placed in the cervix, and the vagina plugged with boiled cotton wool. Twenty-four hours later these were removed, and a hot vaginal douche of creolin solution was given. During the next day two more hot douches were given, and the fundus frequently massaged, after which the patient came into labour. The child, which was lying in the transverse diameter, was turned to a vertex by external version, and some hours later the patient delivered herself of a living child weighing $6\frac{1}{4}$ lbs.

CASE III.—K. C., aged thirty-five, 4-para. Had a history of one child stillborn, one dying soon after instrumental delivery, and a third delivered by forceps with difficulty, still living. The pelvis

measured $3\frac{1}{2}$ inches in the true conjugate. Labour was induced by Krauze's method, but the labour pains passed away when the os was one-half dilated; the membranes were then ruptured, and labour pains commenced again. When she was in the second stage she got maniacal, and could with difficulty be kept in bed. She was anæsthetised, and delivered by the forceps of a living child weighing $4\frac{1}{2}$ lbs. Convalescence in these three cases was normal.

CASE IV.—C. D., aged twenty, 1-para, contracted pelvis; measurement not recorded. Patient was delivered with the forceps. She had a severe attack of secondary post-partum hæmorrhage on the fifth day, otherwise the convalescence was normal.

CASE V.—Reported under "Cæsarean Section."

HYDROCEPHALUS AND PARACENTESIS CAPITIS.

There were three cases of hydrocephalus, two of which had to be tapped.

CASE I.—K. O'K., aged twenty-one, 1-para; presentation, vertex; foetus putrid, weighing 9 lbs.; delivery unaided. Membranes and placenta also putrid; vaginal and uterine douche.

CASE II.—M. R., aged twenty-nine, 9-para; presentation, breech; foetus weighed 8 lbs. The aftercoming head was tapped, and was extracted by Smellie's method.

CASE III.—B. N., aged forty-one, 5-para; presentation, vertex. While the patient was lying quietly in bed, unconscious of labour pains, the membranes ruptured and there was severe hæmorrhage. On examination the os admitted two fingers, and the head, which was hydrocephalic, was resting on the brim. It was tapped, a large quantity of fluid coming away; bipolar version was then performed, and a foot brought down, the subsequent delivery being left to nature. Foetus weighed 11 lbs. In every case convalescence was normal.

CRANIOTOMY.

This operation was performed in three cases.

CASE I.—K. M., aged thirty-eight, 10-para. Detailed under "Brow Presentations."

CASE II.—E. D., aged thirty-nine, 10-para. Admitted in great suffering from the country, where two unsuccessful attempts had been made to deliver with the forceps the previous day. On

admission the vulva was much swollen, the head free above the brim, large caput succedaneum, and no foetal heart audible. Craniotomy was performed with Auvard's instrument; delivery was easy and convalescence normal.

CASE III.—C. W., aged twenty-two, 4-para; her previous children were all born dead. On examination the head was found balloting above the brim and the pelvis obviously contracted, though not measured; the membranes were unruptured, and the os nearly fully dilated. On examining her again forty-five minutes later the foetal heart could not be heard, the cord was prolapsed and pulseless. Craniotomy was accordingly performed. Convalescence was normal.

VERSION.

Version was performed eleven times; external cephalic version was performed twice prior to rupture of the membranes—in both instances for oblique presentations. In one of these cases the cord presented, but the child was dead, so delivery was left to nature.

Internal podalic version was performed in three instances—twice for prolapse of the arms, and once for placenta prævia lateralis with face presentation. In every case the child was born alive. Braxton-Hicks' method of bi-polar version was performed four times—once in a case of generally contracted pelvis, once for placenta prævia, once for prolapse of the cord, and once in a case of hydrocephalus which was tapped. In the two latter cases the child was born dead.

In two cases of transverse presentation, where a hand and foot presented, traction was made on the foot, and the head pushed up. In one of these cases the patient had been in labour forty hours prior to admission, and the membranes had been ruptured several hours. The child was large, weighing $8\frac{1}{2}$ lbs., and was extracted with considerable difficulty; it was born dead. The other child was alive.

In two instances only was there a rise of temperature, and both occurred on the evening of the first day, after which the temperature was normal, and continued so.

PELVIC PRESENTATIONS.

Of the 62 cases of pelvic presentation 34 were full-time, 12 premature, and 16 non-viable. Twelve cases occurred in twin pregnancies. Of the 34 full-time cases 27 infants were alive and 7 dead. Of those cases in which the infant was dead, one was a case of hydrocephalus, the after-coming head having to be tapped; another was a case of impacted breech, admitted from the country, where several unsuccessful attempts had been made to deliver her. A strong fillet of iodoform gauze was passed round the groin of the infant, and it was delivered by traction. In two others there was a large retro-placental clot, the placenta and clot coming away in each case immediately the child was born. Of the 12 premature cases 6 infants were alive and 6 macerated.

TRANSVERSE AND OBLIQUE PRESENTATIONS.

Seven cases presented themselves. In two external cephalic version was performed prior to rupture of the membranes, and a tight abdominal binder applied. In one of these cases there was a presentation of the cord, but no foetal heart could be heard, nor foetal movements felt, neither was there any pulsation of the cord, and the child was born dead.

In one case one arm, and in another case both arms were prolapsed into the vagina. In both cases internal version was performed under an anæsthetic, and the children delivered alive.

Another case of oblique presentation, where the breech would not engage in the brim, was delivered by bringing down a foot.

Another case is reported under twins.

In the seventh case a hand and foot presented; the head was in the left iliac fossa. A foot was pulled down, the head pushed up, and the child (which was large, being $8\frac{1}{2}$ lbs.

weight) was extracted with considerable difficulty; it was dead.

In every case convalescence was normal.

FACE PRESENTATIONS.

Of the six face presentations two were without special interest, and terminated naturally. In three others the child was anencephalic, two of which were associated with hydramnios. The sixth was a case of lateral placenta prævia, in which version was performed, and the child delivered alive as a breech presentation. Convalescence in every case was normal.

BROW PRESENTATIONS.

There were three brow presentations. Two were born as vertex, occipito-posterior; one of these was associated with hydramnios, and in the eighth month of pregnancy; the foetus, although it survived for three hours, was macerated. This patient had a temperature six hours after delivery of 101° F., which rose to 102.6° F. next morning. A creolin uterine douche was administered, and the temperature gradually fell to normal, and continued so, the patient being discharged well on the eighth day.

The third case of brow presentation was admitted with a history of the membranes having ruptured twelve hours previously. Meconium was coming away, os not fully dilated, head free above the brim, and no foetal heart could be heard. Six hours later the head was still above the brim, but the cervix had retracted, owing principally to the formation of a considerable caput succedaneum. Version being contra-indicated, owing to the condition of the uterus, the forceps were applied twice, but without success; the head was then perforated, a large quantity of fluid escaping from it. Craniotomy was performed, and delivery easily effected. It was a left fronto-anterior position. There was a large hydroence-

phalocoele springing through the occipital bone, extending down the neck and back, and upwards on the scalp; it was about the size of a foetal head. Convalescence was normal.

TABLE NO. VIII.—*Prolapse of Funis.*

Name	Age	Para	Period of Pregnancy	Presentation	Child	Remarks
A. G.	27	III.	Full time	2nd vertex	D.	No pulsation in cord; forceps; asphyxia pallida
M. C.	37	III.	5½ months	Breech	A.	First of twins died shortly afterwards
C. W.	22	IV.	Full time	Vertex	D.	Craniotomy, <i>q.v.</i>
K. O.	30	IV.	7 months	Hand, foot and cord	A.	Second of twins, <i>q.v.</i>
B. T.	24	I.	Full time	1st vertex	D.	Fœtus expressed
L. D.	22	I.	"	"	D.	Forceps, head on perineum
M. B.	34	X.	6 months	Footling	D.	Placenta prævia marginalis
E. M. C.	31	VIII.	Full time	Oblique	D.	External version, <i>vide</i> "Oblique Presentations"
E. L.	23	I.	"	Footling	A.	Extraction by foot
M. M. E.	33	VII.	"	1st vertex	A.	Expressed; head on perineum
B. C.	30	VII.	"	"	D.	Forceps; membranes ruptured before admission
M. B.	28	IV.	"	"	D.	Forceps; head just through brim
C. M.	28	IV.	"	"	A.	Labour rapid; Schultzed
L. H.	21	II.	"	2nd vertex	D.	No pulsation; child had a large cystic swelling on the right side of neck, and chest
S. C.	37	VIII.	"	"	D.	Macerated; membranes ruptured 13 days previously
S. B.	30	V.	"	"	D.	Bi-polar version, and foot brought down
A. R.	19	I.	7½ months	Breech	A.	Second of twins; membranes ruptured

There were 17 cases of prolapse of the cord; they are sufficiently described in the above table, with the exception

of three—C. W., K. O., and E. M'C.—which are described elsewhere. In the case of one of the children which lived no pulsation could be felt in the cord before delivery.

Convalescence was normal in every case except in the case of L. D. She had a temperature of 101.2° F. on the second and third evenings; a vaginal douche was given on each evening, and the temperature fell to normal and continued so.

HAND AND HEAD PRESENTATIONS.

On two occasions was the arm prolapsed in full extension in front of the head, once in the second of twins, and once in a 7-para, the head being fixed in the brim in both instances, when the hand presented through the vulva; delivery was left to nature and presented no difficulty. The child in the former case weighed $5\frac{1}{2}$ lbs., in the latter $8\frac{1}{2}$ lbs.

INTERESTING CASES.

CASE I.—M. R., aged twenty-eight, 4th pregnancy. This case is of interest from the fact that the patient—a countrywoman who was on her way to the hospital on foot—was confined at 4.45 a.m. on the road about two miles away. Her husband was the only person near her. The placenta came away in half an hour, after which the husband carried baby and placenta, while the woman walked into the institution, which she reached in a very exhausted condition. The puerperium was uneventful, and she left on the eighth day, mother and baby both well.

CASE II.—A. K., aged twenty-eight, 3rd pregnancy. The confinement was normal; twenty-one hours later, when at stool, there was a procidentia uteri. The uterus was replaced, and a uterine douche administered. Three hours later patient took advantage of the absence of the nurse to leave her bed and walk across the ward; the uterus again came down and was once more replaced. There was no further trouble, and patient went through a normal convalescence, and went out well on the ninth day.

PREGNANCY AFTER HYSTEROPEXY.

CASE III.—L. S., aged twenty-five, 2nd pregnancy. On this

patient an abdominal hysteropexy was performed in the hospital two years previously. The first child was born dead, and was anencephalic. She had on this occasion excessive liquor amnii, and the child, weighing $8\frac{1}{4}$ lbs., was anencephalic and had a large meningocele. She was seen two months later; the uterus was retroflexed. It was replaced and a pessary inserted.

CASE IV.—L. F., aged twenty-nine, 3rd pregnancy. Underwent Makenrodt's operation some time before in the hospital; there was nothing of note in her confinement or puerperium. She was seen three months later; the uterus was retroflexed; it was replaced and a pessary inserted.

MYOMATA IN PREGNANCY.

CASE V.—A. M., aged thirty-three, 2nd pregnancy. The delivery was normal; there was a pedunculated fibro-myoma as large as a tennis ball attached to the right side of the uterus by a thin pedicle about two fingers deep. It was very freely movable, and was noted four years previously when patient was in the hospital. It decreased somewhat in size during the puerperium.

CASE VI.—A. W., aged twenty-seven, 1st pregnancy. Had also a fibro-myoma on the right side of the uterus. It was as large as an orange and was sessile; she had secondary hæmorrhage. There was marked exophthalmic goitre, for which she underwent treatment elsewhere some time previously, and improved greatly. The pulse continued very rapid during convalescence, and reached 144 on occasions, with temperature ranging about 100° F. The pulse decreased rapidly in frequency when the patient sat up.

PROCIDENTIA UTERI IN AN INFANT.

CASE VII.—The infant of M. K., aged twenty, primipara, was found on the second day to have a prolapse of the uterus and vaginal walls. The whole mass was very readily replaceable, but no contrivance proved adequate to keep the parts in place, and they were forced out again directly the child cried. The baby died in a convulsion on the fourth day, and on opening the abdomen it was found that the fundus uteri was just visible on a level with the pelvic floor, all the ligaments being very lax. The child had also a spina bifida, and double talipes calcaneus. Plate V.



PLATE V.—Case of Procidentia Uteri in an Infant occurring on the Second Day.

IMPACTION OF SHOULDERS.

CASE VIII.—L. W., 9-para. The head of the child being delivered, it was found impossible to extract the shoulders (which had become impacted in the antero-posterior diameter) in the usual manner. The body was pushed upwards between the pains, when it was found possible to rotate the shoulders into the transverse diameter, when delivery was effected by traction. The child, which was unfortunately dead, weighed $10\frac{1}{2}$ lbs.

TABLE NO. IX.—*Morbidity.*

Temperature	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Total
100·8° F. and under 101·2° F.	6	4	7	7	5	6	7	7	8	7	9	4	77
101·2° F. and under 102·2° F.	2	5	5	2	5	3	5	4	3	6	2	-	42
102·2° F. and under 104° F.	3	5	4	2	2	1	2	2	1	2	3	3	30
104° F. and under 105° F.	-	1	1	-	2	1	1	-	-	-	1	-	7
105° F. and over	-	-	-	1	-	-	-	-	-	-	1	-	2
Total monthly morbidity	11	15	17	12	14	11	15	13	12	15	16	7	158

SUB-TABLE A.—LIST OF CONCURRENT DISEASES.

Phlebitis	-	-	-	2
Pleuritis	-	-	-	2
Mastitis	-	-	-	16
Influenza	-	-	-	8
Bronchitis	-	-	-	3
Pneumonia	-	-	-	2
Mania	-	-	-	1
Phthisis	-	-	-	1

Total, 35

From this table it will appear on first sight that the morbidity has been extremely high during the year, but not one rise of temperature occurring on, or subsequent to, delivery of, or above, $100\cdot8^{\circ}$ F. has been excluded from our list. On careful examination of the charts we find that in only 42 cases was there any cause to believe the rise was due to infection of the genital canal; no less a number than 81 occurred without any apparent cause, and disappeared without any further treatment than an aperient, and none of these exceeded the normal limits on more than one occasion. Moreover, 35 rises of temperature included in our list were due to a definite cause, without any evidence of infection of the genital canal, and we have tabulated them separately.

All the cases of mastitis, with one exception, were of a trifling nature, and yielded to mild treatment. This case was admitted to the hospital with the right breast full of suppurating sinuses ending in abscess cavities. The patient was anæsthetised, the breast freely opened, curetted, and plugged with iodoform gauze. The patient went out well.

It is very interesting to note that of the total number no fewer than 70 patients were not interfered with before, during, or after delivery, even to the extent of a vaginal examination, also that in 20 other cases a vaginal examination was the only interference.

There were two cases of severe puerperal ulceration of the vagina and cervix, both of which were douched daily and the vagina plugged with iodoform gauze. In one case the temperature ($103\cdot8^{\circ}$ F.) fell by crisis to normal on the sixth day, and continued so. In the other, the temperature, which resembled closely that of a case of typhus fever, fell by crisis to normal on the fourteenth day of the fever (or seventeen days after the confinement) and continued so. At the commencement of the second week she developed an abscess on the inner side of her right ankle, with a superficial inflam-

mation extending to the knee. The abscess was opened, and about two ounces of pus came away; the inflammation rapidly subsided; the joint was not involved, and there was no further trouble from this source.

Antistreptococcic serum (10 c.c.s.) was injected twice daily for one week, but on no occasion was there the slightest reaction, either transitory or permanent.

Ten days after the crisis (27th day) she developed peripheral toxic neuritis, with severe pains in all the joints of the upper extremities and back of the neck, which we attribute to the use of the serum. With this there was a second rise of temperature lasting fourteen days. After this the convalescence was uneventful, and she was discharged two months after admission in good health. Five months later she was seen and was in good health.

TABLE NO. X.—*Mortality.*

Name	Age	Admitted	Delivered	Died	Cause of Death
E. O'D.	32	Dec. 20	Dec. 21	Dec. 23	Cardiac disease
E. K.	36	March 7	March 7	March 8	Chronic Bright's disease
A. M.	28	March 26	March 27	March 28	Hyperemesis gravidarum, <i>q.v.</i>
K. B.	30	June 3	June 4	June 18	Acute mania
J. D.	24	June 11	June 11	June 11	Acute suppurative meningitis
M. C.	30	Oct. 4	Oct. 4	Oct. 23	Pyæmia

CASE I.—E. O'D., admitted from the country with general anasarca, severe dyspnœa and bronchitis, associated with mitral disease and failing compensation. The urine was loaded with albumen. She was delivered nine hours after admission. Considerable improvement took place in her condition under treatment with expectorants, laxatives, and digitalis, until the evening of the second day, when she had a sudden and severe attack of cardiac dyspnœa, and survived only until the next day.

CASE II.—E. K., also admitted with general anasarca and laboured breathing. Face puffy, pulse irregular, urine albuminous, but no abnormal cardiac sounds. She gradually sank and died next day. Autopsy showed that the kidneys were granular and contracted. There was cyanotic atrophy of the liver and œdema of lungs.

CASE IV.—K. B. During the puerperium this patient showed signs of eccentricity. On the fourteenth day she developed puerperal mania and became very violent. Next day she fell into a sleep, the breathing became stertorous, and she died suddenly. No autopsy could be obtained.

CASE V.—J. D. Reported under "Cæsarean Section."

CASE VI.—M. C. See "Cæsarean Section."

TWO YEARS' WORK AT THE SAMARITAN HOSPITAL FOR WOMEN, BELFAST.

By JOHN CAMPBELL, F.R.C.S., ENG.; M.A., M.D., M.Ch., and
M.A.O., IREL.;

Surgeon to the Samaritan Hospital for Women, Belfast;
Assistant Surgeon to the Belfast Maternity Hospital.

[Read in the Section of Obstetrics, April 21, 1899.]

History.—The Samaritan Hospital for Women, Belfast, was founded in 1872 by the late Dr. W. K. M'Mordie. Two years later, in 1874, the present building was erected through the munificence of the late Mr. Edward Benn, who did so much for the charitable institutions of Belfast. In 1898, through the generosity of Mr. Forster Green, two isolation wards were added to the original building.

Description of the Hospital.—The hospital stands in an open situation and consists of three storeys—viz., a ground floor, containing the waiting and consulting rooms for patients, the dispensing room, and rooms for nurses; the first floor containing a large and a small ward and nurses' bedrooms; and the second floor containing two wards and an operating room as well as a nurses' bedroom. Behind the main building are the two isolation wards, with four beds in each. They are approached from the landings of the main staircase by passages ventilated through glass louvre windows. They are reserved for cancerous and suppurating cases. The total possible accommodation of the hospital amounts to thirty beds, but not more than twenty-five are in constant use.

The Admission of Patients.—Cases are seen first in the out-patient department, and, if suitable, are admitted to the house. In the out-patient department all comers are

examined without question. Each patient is then given the following form filled up, and is requested to submit it to her doctor, who can either treat her himself or fill up the annexed form recommending her for hospital treatment. This system is, so far as I am aware, unique in hospital management, and is, I think, applicable to general hospitals as well as to the smaller special ones. I venture to mention it here in the hope that I may thus to some extent assist in the crusade against the shameful abuse of medical charity which has become so widespread. No other method with which I am acquainted so well prevents the well-to-do from usurping the privileges of the really poor. It makes the hospital what it should be—a place to which medical men can send their poor patients for special advice and treatment—and it throws the responsibility of abusing the hospital upon the members of the profession themselves.

I exhibit the printed forms used:—

“Samaritan Hospital for the Treatment of Diseases Peculiar to Women, Lisburn-road, Belfast.

“I recommend

as a fit person

to receive gratuitous advice and treatment.

“Signed,

“Address,

“Date,

*“Samaritan Hospital for Women.—Dr. John Campbell’s Clinic,
Mondays and Fridays at 10 a.m.*

“NOTICE.—Dr. Campbell gives advice at the Hospital to those only who are in poor circumstances, and are objects of charity. When possible, the patient should bring a letter from her family doctor, stating that she is deserving of gratuitous treatment.

“To Dr.

“Re Mrs.

“Date,

“Diagnosis:—

“Treatment recommended:—

On the admission of the patients, cancer cases with discharge and suppurating cases are put in the isolation wards. If they require operations, these are performed in the ward. All other cases are admitted to the general wards, and are operated upon in the operation room. After operation the minor cases go back to the general wards, but cases in which the peritoneal cavity has been opened are transferred to a special three-bedded room, in which they remain for a week or more.

PREPARATIONS FOR OPERATIONS.

The following is the routine practised in preparing for an operation :—

1. *Preparation of the Patient.*—For three or four days the patient is kept under observation. Her diet is restricted, and her bowels regulated. She gets a hot bath and a vaginal douche of 1 in 1,000 corrosive sublimate daily. Over the seat of operation a compress soaked in saturated solution of boric acid and covered with gutta-percha tissue is worn. The day preceding operation the parts are well washed with soap and water, then rubbed with turpentine, and washed again, and finally, soaked in corrosive sublimate, 1 in 1,000 strong, and covered by a compress wrung out of lotion of the same strength. The washing and application of corrosive sublimate is repeated in the morning two hours before operation, the bowels having been previously emptied by an enema of soap and water. The corrosive compress last put on remains until the patient is anæsthetised. The patient's legs and arms are wrapped in cotton wadding covered by sterilised bandages, and she wears a short sterilised jacket fastened at the back. Finally, the field of operation is surrounded by sterilised towels.

2. *Preparation of the Room.*—All septic cases are as far as possible, excluded from the operation room. Previous to the performance of intra-peritoneal operations carbolic acid

is vaporised in the room by Mr. Conway Scott's method. During the operation the temperature is kept at about 70° F. by means of an open fire. The patient lies on a rubber cushion filled with hot water. This I regard as a matter of vital importance, and for my private cases I have a portable cushion, made by Messrs. Fannin, which I can take to the patient's house. The Trendelenburg position is used in a large proportion of the cases, and is got by means of a Krug's frame.

3. *Preparation of Instruments and Dressings.*—Metal instruments, rubber tubing, silk, silkworm gut, and Mackintosh sheets and aprons are boiled for at least five minutes in soda solution. Knives are boiled for only one minute. Dressings, towels, bandages and operating coats are sterilised by steam for half an hour. During the progress of an operation the instruments are occasionally re-boiled, and ligatures and sutures are transferred direct from the boiling water to the patient.

4. *Preparation of the Operator and Assistants.*—The hands are well washed with soap and hot water and a boiled nail brush; rubbed with turpentine; washed again in soap and water; soaked in permanganate of potash solution; decolorised by oxalic acid solution; and finally held for two minutes in 1 in 1,000 corrosive sublimate solution. During the operation they are frequently rinsed in 1 in 1,000 sublimate solution. While attaching all due weight to the use of disinfecting fluids for the hands, I think success largely depends on the operator having an assistant and an operation nurse well trained in aseptic principles and employed exclusively in gynaecological work, so as to avoid all possibility of their being brought in contact with dangerous cases. When I have to operate a day or two after exposure to sepsis, I wear rubber gloves. The common gloves used by washerwomen

do very well for most abdominal operations. They are boiled for at least five minutes, and after they are put on the gloved hands are dipped from time to time in boiling water. My experience has been that danger from the room and surroundings, from the instruments and dressings, and from the surgeon and assistant can easily be got rid of, but that in many cases the patient, in spite of all you can do, remains a source of peril to herself, either because of the nature of her disease or of the necessity for opening up septic cavities during the operation.

5. *Anæsthesia*.—Chloroform is almost invariably used, and is given by Junker's inhaler. I have found it safe and convenient. Danger with its use arises from faulty methods of administration and from deficient knowledge of the principles on which it should be given. The chief object of an anæsthetist should be to keep the patient *continuously* "under." This can only be done by means of some such arrangement as we have in the Junker's inhaler. In any of the open methods the patient is put deeply under, and then allowed to partially come to again, and so on. In fact the patient alternates between the condition of being half poisoned and that of being half conscious. She is thus exposed to danger from an excessive amount of chloroform at one time, and to that of syncope during returning consciousness at another. A little observation of a patient under anæsthesia shows that she only becomes sick and faint when she is coming from under its influence—in other words, sickness is one of the earliest signs that the patient is not getting enough anæsthetic. A few whiffs more will at once overcome it, while the almost universal practice of allowing her to vomit only increases her danger. I cannot but regard sickness as an evidence of incompetence on the part of the chloroformist. The chloroform is, as far as possible, used out of freshly opened bottles. Occasionally methylene or A.C.E. is given in particular cases.

6. *Flushing and Drainage in Abdominal Cases.*—Flushing is, as far as possible, avoided. It is only done in cases of tubercular peritonitis or those in which glairy fluid has escaped into the abdomen. Plain boiled water is used. In all other cases sponging is relied on. Drainage is used under the following circumstances:—After flushing; in cases where a notable amount of peritoneal fluid has been present; and in cases in which pus has escaped during the operation. I believe the current of professional opinion has now set in too strongly against drainage. In my opinion drainage is harmless in cases such as the above-mentioned, and saves the lives of some of the patients. I prefer a glass drainage tube with a wick of gauze in it for the abdominal cavity. A small gauze drain floats on the intestines, and has little influence on the pelvic cavity, where fluid most accumulates, while a large one prevents the bowels from resuming their normal position, hence a rigid tube is necessary to keep the gauze in place. When drainage is employed the head of the bed should be raised 10 or 12 inches.

7. *Dressings.*—Ordinary wounds are dressed with sterilised gauze, which is left untouched for from 12 to 14 days, at the end of which time the sutures are removed. In cases where drainage is employed the gauze is dusted with iodoform, and the dressings are changed as often as they become soaked in discharge. Silkworm-gut sutures, including the whole thickness of the abdominal wall, are used.

Treatment after Operation.—Morphia is avoided if possible. One hypodermic of half a grain is given if absolutely necessary. The administration of fluid by mouth depends on the amount of sickness. If it is slight, water, whey, or cream of tartar solution is given in sufficient quantity to alleviate thirst for the first twenty hours; if sickness is, on the other hand, troublesome, only sips of hot water are

given till it has abated. The bowels are opened by purgatives or enemata on the third day, different purgatives being chosen in different cases, in accordance with our previous experience of the patient.

During the two years under consideration I performed in the Samaritan Hospital forty-four intra-peritoneal operations. These I have grouped under nine heads, namely:—

- I. Ovarian Tumours.
- II. Diseases of Tubes.
- III. Tumours of the Broad Ligament.
- IV. Fibro-myomata of the Uterus.
- V. Cancer of the Uterus.
- VI. Displacements of the Uterus.
- VII. Tubercular Peritonitis.
- VIII. Diseases of the Kidneys.
- IX. Diseases of the Alimentary Tract.

I. OVARIAN TUMOURS.

Of the twenty-four patients admitted under my care with ovarian tumours, twenty-one underwent operation. One of these was suppurating and pointing as an abscess, and was incised and drained, thus leaving twenty treated by abdominal section. Of these twenty, sixteen were ordinary ovarian cysts, three were dermoids, and one was a solid tumour of the ovary. In one case (40) there was a dermoid on one side, and a solid tumour on the other. The ages of the patients varied between 65 and 21. In one case a second median incision was made above the navel to allow of adhesions being separated. The size of the wound was thus materially diminished by a broad band of uncut abdominal wall in the neighbourhood of the navel between the upper and lower incisions (23). In three cases both ovaries were removed (5, 35, and 40). In four cases one ovary was removed and the second resected (11, 14, 18, 19).

Removal of the adherent cyst wall was incomplete in two cases, but the small portions left caused no trouble. In one case (33) a fæcal fistula formed. There had been dense adhesions, and fæcal fluid appeared through the drainage tube within twenty-four hours, but it quite ceased by the sixteenth day. The pedicle was secured by interlocking silk ligatures in all the cases. When the stump surface was large, the peritoneum was drawn over it by a few points of silk suture. In one case the pedicle was secured in the abdominal wound to remedy a retroversion of the uterus. In one of the cases a few small cysts in the left ovary were simply punctured with the knife after the right had been removed. The patient developed a mild phlebitis on the left side. I had formerly had a similar experience from ignipuncture of an ovary. All these twenty patients recovered.

II. DISEASES OF THE TUBES.

The abdomen was opened in three instances for disease of the tubes, apart from other mischief. In one case (7) the tubes were catheterised, the ovaries being resected at the same time. The result, however, has not been satisfactory, as the patient still complains of pain in the iliac region. In this connection I may note that my experience of operations done for pain without the presence of some tangible lesion has been unfavourable. Such patients complain as much after the most thorough-going removal as before. I, therefore, now refuse to remove the uterine appendages for pain unless I can detect some very obvious pathological condition. In this tubal group of cases I had one intra-uterine fœtation (25) in which a four months fœtus was removed from the right broad ligament. The third tubal case (31) was a very interesting one. She had been confined at term a month previous to her admission, forceps

being used. Dr. Henry, of Comber, who attended her, wrote to me stating that a tumour, apparently in the recto-vaginal septum, had been forced down by the head and had interfered with the progress of labour. On examination we found a smooth rounded tumour to the left of the uterus. At the operation this was found to be a thick-walled tumour of the inner half of the tube, myomatous in appearance, and containing an ounce of fluid resembling retained menstrual blood. Beyond this tumour the tube was dilated, its walls being thinned and adherent to the ovary. It also contained fluid like retained menstrual blood.

III. BROAD LIGAMENT TUMOUR.

Case 26 was a remarkable one. In August, 1896, she presented herself with a firm abdominal tumour of large size, having two lobes separated by a median vertical groove. A small exploratory incision was made, and the tumour found to have the appearance and consistence of normal liver substance. A bluish cyst seen at its lower border at the pelvic brim was taken to be the gall-bladder. Further operation was, therefore, abandoned, and the patient discharged in due course. Two years later, in May, 1898, she again appeared with her abdomen immensely distended and, in part, fluctuating, and her uterus hanging between her legs. She wanted her womb cut off so that she might be able to walk a little. She was very weak and wasted. Operation was again undertaken. The tumour was found to spring from the right broad ligament by a pedicle as thick as a man's wrist, which could be traced close to the uterus. The tumour was fibro-cystic in structure, and weighed 20 lbs. even after it had drained for two hours. The ovary and tube lay on the surface of the tumour, but formed no part of it. The pedicle was secured by six strong silk ligatures and was attached to the lower end of the wound by the lower abdominal stitches. The pulse could not be felt at

the wrist at the termination of the operation. Recovery was protracted, but ultimately good, and she is now well.

IV. FIBRO-MYOMATA OF THE UTERUS.

Nine patients were operated on for fibroids. Four abdominal hysterectomies were done by the extra-peritoneal method and they all recovered. One pedunculated sub-peritoneal tumour of large size was amputated successfully. In one case enucleation was practised through an abdominal incision, but the patient died of shock. In one case an exploratory incision was made, but the appendages could not be got at, and the patient's condition was not good enough to allow of panhysterectomy being successfully done. In two cases the uterus was removed with success *per vaginam*. My previous experience of intra-peritoneal amputation, and of panhysterectomy had not been favourable, so in these cases I preferred the extra-peritoneal method, where possible. Latterly I have returned with success to the intra-peritoneal method. The more I see of fibroids the more inclined am I to look upon the disease as a dangerous one, and to contrast the ease and safety of vaginal removal of moderate sized tumours with the risk of abdominal operation in the larger ones. The fatal case of enucleation illustrates the danger of that method, and one of the cases of vaginal hysterectomy (30). also showed its imperfection; for she had undergone a vaginal cœliotomy and enucleation of a large fibroid from the posterior uterine wall in January, and in July she required vaginal hysterectomy for a tumour as large as the first, and causing as much interference with micturition.

V. CANCER OF THE UTERUS.

Vaginal hysterectomy was done in one case for cancer of the corpus, and in another for cancer of the cervix uteri. Both recovered. In this disease hospital practice contrasts

strongly with private. Few cases come to hospital in time to have complete removal successfully accomplished, while a considerable proportion of private patients are seen soon enough to give a fair prospect of a satisfactory issue.

VI. DISPLACEMENTS OF THE UTERUS.

One case of prolapse and one case of retroversion had vagino-fixation done. The result was satisfactory in both.

VII. TUBERCULAR PERITONITIS.

The abdomen was twice opened for tubercular peritonitis. One (6) patient had a considerable accumulation of fluid and appears to have been cured by drainage. The other (9) had but little fluid and received little, if any, benefit from the operation.

VIII. DISEASES OF THE KIDNEYS.

The case of hydronephrosis (13) was rather puzzling at first, as she was ten months married, had secretion in her left breast, and thought she was seven months pregnant. The tumour lay in contact with the uterus, and was at first thought to be in the broad ligament. The other renal case (39) had tubercular abscesses. Both did well.

IX. DISEASES OF THE ALIMENTARY CANAL.

Gastrostomy was done in a case of cancerous stricture of the œsophagus (20) and gave an excellent result. The vermiform appendix was removed once (43). The tumour was exposed in a case of cancer involving the ileo-cæcal valve (42), with the idea of forming a temporary fistula, and later on excising the growth. The patient was, however, much exhausted by obstruction of the bowels which had existed for some weeks, and died shortly after the preliminary operation.

MORTALITY IN THE CASES OF INTRA-PERITONEAL OPERATIONS.

In the forty-four cases in which the peritoneal cavity was opened two deaths occurred. One was from shock, in an alcoholic patient, who lost a good deal of blood during the enucleation of a large fibroid. The other occurred in the case of intestinal obstruction from cancer of the cæcum, and was due to exhaustion from starvation, as she was unable to retain anything in the stomach, or to keep nutrient enemata. I am fully alive to the importance of keeping the mortality of operation cases as low as possible, but I am afraid that, if we are over-anxious to produce good statistics, we are liable to deprive some of our patients of a chance of regaining their health or preserving their lives. My mortality in hospital practice during the past two years has been $4\frac{1}{2}$ per cent. Considering the nature of the cases, and the variety of abdominal organs operated upon, this is probably as good as an abdominal surgeon can expect to obtain.

FORM OF REQUEST TO BE SIGNED BY THE PATIENT'S RELATIVES
BEFORE ALL MAJOR OPERATIONS.

I should like, at this juncture, to call your attention to a form which I have used during the last four years. On it I write my opinion as to the nature of the case and the operation required, and give an estimate of the percentage of risk attending operation. In uterine and ovarian cases I also state the probable influence of the operation over the menstrual function and pregnancy. The paper is then handed to the patient, and to her husband or other near relative to sign. I find it an excellent plan. It makes the people feel that they themselves must take the responsibility of deciding to have their diseases removed, and prevents the surgeon from appearing to be an advocate of operation when his duty is merely that of an adviser.

"We, the undersigned, do hereby request Dr. John Campbell to undertake the treatment of
and to perform whatever operation he may think necessary.

"Name,

"Address,

"Name,

"Address,

"Date,

"

MINOR OPERATIONS.

The minor operations require no special mention. None of them was followed by death.

In conclusion, I have to thank you for your patient hearing, and to express the hope that I have not trespassed too far on the time of the meeting.

Table of Diseases treated in the Wards from 1st January, 1897, to 31st December, 1898.

Diseases	Treatment	Diseases	Treatment
VULVA.			
Epithelioma - 2	Excised.	Fibroid - 1	Removed by abdominal section.
Fibroma - 1	do.	Salpingitis - 7	—
Sinus - 1	Scraped and drained.	Tubal gestation - 2	Removed by abdominal section in 1; other diminished.
PERINEUM.			
Lacerations - 12	Repaired.	OVARIES.	
RECTUM.			
Anal fissure - 1	Incised.	Cysts - 20	16 removed; 1 suppurating — incised and drained.
Carcinoma - 1	Excised.	Dermoids - 3	Removed.
Hæmorrhoids - 5	Removed.	Solid tumours - 1	do.
URETHRA.			
Coruncle - 1	Excised.	Ovaritis - 2	—
Stenosis - 1	Dilated.	PELVIC CELLULAR TISSUE.	
Ulcer - 1	Cauterised.	Cellulitis - 4	—
BLADDER.			
Carcinoma - 1	—	Fibro-cystic tumour - 1	Removed by abdominal section.
Cystitis - 7	Dilatation of urethra and swabbing with carbolic.	Pelvic abscess - 1	Incised and drained.
Ulcer - 1	Curetted and cauterised.	Pelvic tumour - 1	—
Vesico-vaginal fistula - 3	Repaired.	ABDOMEN.	
		Ascites - 1	Tapped.
		Tumours - 3	—
		Tubercular kidney - 1	Excised.
		Abscess of kidney - 1	Incised and drained.

URETERS.			Movable kidney -	- 1	Sutured:
Inflammation -	- 1	-	Hydronephrosis -	- 1	Excised.
VAGINA.					
Vaginitis -	- 1	Perchloride douches.	Renal calculi -	- 2	-
Tumour -	- 1	Excised.	Perforated gastric ulcer	1	-
CERVIX UTERI.					
Cancer -	- 6	Vaginal hysterectomy in 1 ; amputation in 1.	Intestinal obstruction -	1	-
Hypertrophy -	- 1	Amputated.	Hernia : -	- 1	Reduced.
Inflammation -	- 6	Curetting.	Cancer of liver -	- 1	-
Lacerations -	- 4	Emmet's operation.	Peritonitis -	- 6	Abdominal section and drain- age in 2 tubercular cases.
Polypi -	- 6	Removed.	Lumbar abscess -	- 1	-
Stenosis -	- 3	Dilated.	Cyst of inguinal canal -	1	Excised.
CORPUS UTERI.					
Antiflexion -	- 16	do.	BREAST. Abscess -	- 2	Incised.
Cancer -	- 1	Vaginal hysterectomy.	Cancer -	- 4	Amputation.
Chronic endometritis -	- 33	Cured.	Tumour -	- 3	Excision.
MISCELLANEOUS.					
Hamorrhagic endometritis	8	Curettng, and subsequent injection of iodised phenol.	Cancer of oesophagus -	1	Gastrostomy.
Fibroids -	- 21	-	Lateral spinal curvature	1	-
Metritis :	- 16	Curetted.	Syphilis -	- 1	-
Prolapse -	- 2	Vagino-fixation in 1.	Hysteria -	- 1	-
Retroflexion -	- 11	-	Neurasthenia -	- 2	-
Retroversion -	- 21	Vagino-fixation in 1.	Sciatica -	- 1	-

Table of Intra-Peritoneal Operations, from January, 1897, to December, 1898.

No.	Age	Condition	Disease	Duration of Symptoms	Date of Operation	Operation	Result	Remarks
1	42	Married	Fibroid Tumour of uterus with salpingitis and ovaritis	2 years	1897 Jan. 6	Vaginal hysterectomy	Recovery	—
2	49	do.	Bleeding fibroid	3 "	Feb. 10	Abdominal hysterectomy	do.	Very free bleedings were frequent.
3	24	do.	do.	2 "	March 23	do.	do.	The patient was much exhausted by frequent bleedings.
4	47	Single	Cancer of uterus	9 mths.	" 27	Vaginal hysterectomy	do.	—
5	43	Married	Ovarian tumours	2 years	April 10	Removal	do.	—
6	20	Single	Encysted ascites (tubercular)	2 "	May 6	Abdominal section and drainage	do.	—
7	30	Married	Salpingitis and ovarian cysts	2 "	June 3	Resection of ovaries and catheterisation of the tubes	do.	—
8	23	Single	Bleeding fibroid	5 "	" 8	Abdominal hysterectomy	do.	There was a rise of temperature before operation, due to inflammation of the tumour.
9	20	do.	Tubercular peritonitis	1 year	" 8	Abdominal section and drainage	do.	—
10	34	Married	Ovarian tumours	6 mths.	July 2	Removal	do.	The tumours were retro-peritoneal and had papillomatous outgrowths of malignant appearance.
11	19	Single	Ovarian tumour	9 weeks	" 22	do.	do.	—
12	45	do.	do.	10 mths.	Aug. 5	do.	do.	Some of the cyst cavities had suppurated; were very adherent.

13	33	Married	Hydronephrosis	-	11	"	14	Abdominal section and removal of kidney	do.	-
14	37	Single	Ovarian tumour	-	2 years	Sept.	29	Removal	do.	-
15	55	Married	do.	-	1 year	Nov.	13	do.	do.	The tumour was adherent to the abdominal and pelvic walls, the bowel, and the uterus.
16	40	Single	Pedunculated fibroid	-	3 years	Dec.	30	do.	do.	The tumour was rapidly growing.
1898										
17	31	Married	Fibroid	-	-	Jan.	8	Abdominal enucleation	Died	Alcoholic. Died in ten hours.
18	22	Single	Dermoid cyst of ovary	-	2 mths.	Feb.	16	Removal	Recovery	-
19	44	do.	Ovarian cyst	-	1 year	"	22	do.	do.	Pedicle twisted.
20	41	Married	Cancer of oesophagus	-	4 mths.	March	20	Gastrostomy	do.	-
21	23	Single	Cystic adherent ovaries	-	4 years	April	17	Removal	do.	-
22	42	do.	Cysts of both ovaries	-	2 "	"	17	do.	do.	Phthisis.
23	30	Married	Ovarian cyst	-	5 mths.	May	1	do.	do.	-
24	37	do.	Prolapse of uterus	-	-	"	12	Vagino-fixation	do.	-
25	28	do.	Extra-uterine fetation	-	?	"	15	Removal	Recovery	Child of four months.
26	28	Single	Fibro-cystic tumour of right broad ligament	-	3 years	"	21	do.	do.	Abdominal section. Aug 8, 1896.
27	25	do.	Solid ovarian tumour	-	10 mths.	June	7	do.	do.	Colloid cyst.
28	36	Married	Fibroids	-	2 years	"	7	Exploratory laparotomy	do.	-
29	37	do.	Ovarian cyst	-	?	"	23	Removal	do.	-

Table of Intra-Peritoneal Operations—continued.

No.	Age	Condition	Disease	Duration of Symptoms	Date of Operation	Operation	Result	Remarks
30	37	Single	Fibroid	7 years	1898 July 13	Vaginal hysterectomy	Recovery	June 12, 1897. Vaginal celiotomy, with enucleation of fibroid from posterior uterine wall.
31	45	Married	Fibroid of tubes	1 mth.	" 15	Removal	do.	—
32	21	Single	Ovarian cyst and left hydrosalpinx	?	" 20	Removal of cyst and resection of tube	do.	—
33	50	do.	Ovarian cyst	—	" 20	Removal	do.	Pedicle twisted and many adhesions.
34	52	Married	Hypertrophy of cervix and retroversion	2 years	" 21	Amputation of cervix and vagino-fixation	do.	—
35	34	do.	Ovarian cysts	2 weeks	Sept. 6	Removal	do.	—
36	28	do.	Dermoid and salpingitis	2 years	" 10	Removal of tubes and resection of ovaries	do.	—
37	24	Single	Ovarian cyst	14 mths.	" 27	Removal	do.	—
38	65	Married	do.	—	" 27	do.	do.	Papilloma.
39	25	Single	Suppurating kidney	2 years	Oct. 18	do.	do.	—
40	26	Married	Solid tumour of left ovary and dermoid of right	2 mths.	Nov. 3	do.	do.	Adhesions.
41	37	do.	Cancer of cervix	—	" 20	Vaginal hysterectomy	do.	—
42	30	Single	Cancer of œcum	4 mths.	" 25	Typhlotomy	Died	Much exhausted by starvation.
43	—	do.	Appendicitis	—	" 26	Appendix removed	Recovery	—
44	—	do.	Fibroid	—	" 30	Abdominal hysterectomy	do.	—

DR. F. W. KIDD expressed his approval of the printed forms which patients were asked to sign before undergoing an operation. He thought that gloves should be used in operations only when they suspected that they could not render their hands completely aseptic. He did not agree with Dr. Campbell's opinion that all the dangers of chloroform were due to maladministration. When chloroform was administered guttatum he had seen no ill effects. Dr. Campbell's mortality of 4.5 per cent. was very satisfactory.

DR. SMITH said he had practically given up drainage. He believed that after a few hours no drainage took place, since a layer of protective lymph was thrown out round the tube which acted as a foreign body. Moreover, a solid drainage tube pressing against the rectum was capable of causing a fistula. The operation he preferred was retro-peritoneal hysterectomy, which gave excellent results.

MR. M'ARDLE, referring to pelvic pain remaining after removal of the tubes and ovaries, said that nearly all the abdominal viscera reflected pain to the pelvis after laparotomy. It was not uncommon in gouty affections of the kidneys to have the pain referred to the pelvic region, and in many instances of spinal lesions the chief pains were pelvic. He strongly advocated the intraperitoneal method of operating, and considered drainage of the peritoneal cavity unnecessary, except where there was some intestinal lesion or some infection of the peritoneal cavity. He did not believe there was any need of the printed form to be signed by patients about to undergo operation.

DR. MACAN agreed with Surgeon M'Arde's last remark about the printed form which Dr. Campbell had shown them.

DR. PUREFOY said he was one of those who practised drainage, but he had never used a rigid tube. The gauze drain, in the form of a Mikulicz' bag, or otherwise, he was satisfied was of the utmost use.

DR. CAMPBELL, replying, said he believed that sudden death during the administration of chloroform was generally due to the use of a too concentrated solution. With regard to drainage, it was quite true that it was useless after a few hours, but it was during those few hours that it was especially required. He considered the vaginal method of operating on fibroids the best, when it could be done. The printed form he had shown them was designed to show the patient that operation was indeed the lesser evil.

FURTHER OBSERVATIONS ON UTERINE CANCER AND ITS TREATMENT.

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[Read in the Section of Obstetrics, April 21, 1899.]

THERE can, unfortunately, be no question of the increasing frequency of cancerous disorders, including those of the uterus, as evidenced by recent reports of the Registrar-General. Nor is there less doubt of the wide differences of opinion still existing with regard to the respective value of the various methods of treatment available in cases of malignant diseases of the uterus. I, therefore, venture to bring the latter subject again before the Gynæcological Section of the Academy, in the hope that even so imperfect a recapitulation of my earlier and more recent observations may possibly elicit the opinions of others more competent than myself to discuss the gravest and not least frequent of the maladies peculiar to women.

Whether the views expressed in this paper are likely to be confirmed or corrected it is not for me to anticipate. In either case I shall content myself with the belief that they are not altogether devoid of clinical foundation, being based on observations extending over a period of twenty-five years in the gynæcological department of the Mater Misericordiæ Hospital, Dublin.

Within the last six years, from November, 1892 to 1898, inclusive, 1,056 gynæcological cases came under notice at the hospital, and of these 31 were cases of uterine cancer, and 12 of vulvar or vaginal malignant disease—that is to say, the

proportion of such cases to all others was, roughly speaking, 3 per cent. of the former, and 1 in 88 of the latter. In the preceding five years there were somewhat less cases of uterine cancer—viz., 23—and 10 cases of vulval or vaginal malignant disease noted.

Moreover, although I cannot at present tabulate my earlier experience, I have sufficient evidence in my former notes of a large number of cases of uterine cancer to justify the conclusion that the proportion of such cases observed in the hospital during my first fourteen years' service there, although somewhat smaller than that recorded in the more recent periods, were it to be tabulated, would include considerably upwards of a hundred cases of uterine carcinoma within that twenty-five years referred to.

Confining myself, however, to the cases of this kind noted in the last eleven years, I may observe that the general origin of uterine cancer in the cervix was, I think, shown in 47 out of these 54 instances. In them, also, its probable connexion with cervical lacerations, in a majority of cases, was evinced by its occurrence in 39 women who had borne children, and in only 15 nulliparæ or unmarried women. Whilst of the other predisposing causes of carcinoma uteri, that of age was proved by the fact that 36 of these patients were approximating to or shortly beyond the menopause—*i.e.*, from 40 to 50 years of age; 10 were beyond the latter age; 8 were under 40, and of these one instance of medullary cancer of the uterus occurred in a girl only sixteen years of age.

In these observations, dealing with this subject as I now do from a clinical standpoint, under the heading cancer or carcinoma of the uterus are included not only epithelioma, medullary, encephaloid, or soft cancer, and the more exceptional scirrhus or hard carcinoma, but also sarcomatous growths within the connective tissue of the uterus, and the

other malignant conditions that are clinically though not histologically inseparable.

Hence, I must here group together all those pathological conditions of the uterine tract characterised by the malignant development of infective cells, by the local proliferation or constitutional effects of which (unless the result be obviated by timely and complete removal of the primary disease; or by some intercurrent fatality) death must eventually and inevitably be occasioned.

Early Diagnosis and Symptoms of Uterine Cancer.—I may remark that my chief purpose in this paper is to re-urge the importance of early recognition and prompt treatment of the first evidences of cervical carcinoma, inasmuch as I hold that once the disease has extended upwards so as to implicate extensively the superior uterine zones, or when it has originated in and largely disorganised the latter, any treatments proposed, including hysterectomy, can as a rule be regarded as merely more or less effective palliative measures.

Of the ordinary symptoms by which in the cases referred to patients were induced to apply for the gynæcological examination, by which the nature of their disease was disclosed, the most important were hæmorrhagic or other abnormal vaginal discharges to which, though generally at a later period, uterine or peri-uterine pain were commonly added.

Amongst these earlier symptoms one of the most frequent and constant was hæmorrhagic uterine discharge unconnected with other recognisable causes. This, more especially when occurring after the climacteric period, should arouse suspicion of its probable source in malignant disease, and always demands that careful local investigation by which its origin may be traced.

Vaginal Discharge in Cancerous Cases.—Another generally early and characteristic symptom of malignant disease of the

uterus, and particularly of its medullary forms, is a thin albuminoid exudation from the vagina, occasionally blood-stained, but more commonly of a light greenish colour, and offensive in smell from the first. This, as the malady progresses, gradually becomes more excessive in quantity as well as more ichorous, blood-stained, or muco-purulent, and, above all, assumes a special and almost pathognomonic factor, distinct from the foetidity frequently present in other gynaecological cases where local cleanliness is neglected. By this irritant exudation the external parts in cases of advanced cancer are liable to become excoriated, and the most intense pruritus occasioned. Whilst at the same time, by the abominable and far-penetrating odour of that profuse albuminoid cancerous discharge by which her genitalia are bathed and her linen stiffened, as though with putrescent starch, the wretched patient's life is rendered a misery to those about her as well as to herself. This trouble is, however, one which may generally be effectually relieved by the means to which I must again refer.

Pain.—The extent and character of the pain complained of in cases of uterine cancer is chiefly dependent on the locality as well as the special form of the disease in each instance, being most intense where the fundus or body are implicated, and least experienced where the disease is in the vaginal portion of the cervix, more especially in the more common epitheliomatous and medullary growths. In such cases the cervix may occasionally be destroyed by the former, or the vagina filled by the latter, without the occurrence of any very acute suffering.

In few of the instances of uterine cancer that have come before us was pain, one of the earlier of the symptoms by which the patient's attention was called to her disease. But generally, as the disease progresses, and more especially in its scirrhus form, the so-called pathognomonic dolor gradually

manifests itself, and by the increasing burning or lancinating pain, chiefly referred to the sacral region, and always exacerbated at night, the patient is at length driven to seek relief, and that too frequently only when a cure is all but hopeless.

It therefore cannot, I think, be too often reiterated that it is possible to recognise the incipient stage of cervical cancer, should the patient fortunately come under examination before the advent of so-called pathognomonic symptoms or cachexia. I have elsewhere more fully referred to the methods by which this may be accomplished, but as their great importance and significance are not infrequently ignored they may be here briefly recapitulated. In the first place, then, even at an early stage of the disease, as was long since pointed out by Montgomery, on careful examination the margin of the os uteri is found hard and often fissured. In the situation of the muciparous glands there are felt several small and distinctly defined projections, almost like grains of shot or gravel under the mucous membrane. Pressure on these with the point of the finger gives rise to pain or nausea. The circumference of the os uteri feels indurated or turgid, and is of a deep crimson colour, or, if eroded, presents some slightly projecting points, which bleed readily on touch. These nodules when excised will be found under microscopic examination to afford all the characteristics of malignancy, and hence the cautious employment of the curette so as to bring away a sufficient amount of the abnormal tissue for microscopic examination should be resorted to in every case of suspected or possible adenomatous or cancerous degenerations. I have to thank my colleague, Professor McWeeney, for having by the examination of such specimens afforded me the evidence of malignancy in several cases long before any characteristic hæmorrhage, discharge or pain was complained of, and so enabled the removal of the disease whilst it was still, as I believed, thus curable.

Amputation of Cancerous Cervix Uteri.—I have already stated that in the vast majority of the cases of uterine cancer that came under my observation the disease commenced in the vaginal portion of the cervix, and in only one-fifth of them did it apparently originate in the body or fundus uteri. Moreover, in that large proportion of such cases the cancer apparently remained, for a time at least, localised within the cervical zone, whence, as clinical experience demonstrates, it may in some cases be effectually removed by the timely amputation of the cervix above the area of malignant infection. Nor do the reasons, properly applied in other cancerous affections to the removal of a portion of the organ implicated, appear to me to justify the objections raised on such grounds to that procedure in the cases now referred to, inasmuch as the cervix is structurally distinct from, although anatomically continuous with, the body and fundus of the uterus. I shall not, however, dwell on this point, but will merely mention some of the facts on which the views stated are based.

The Results of Early Removal of the Cancerous Cervix.—With regard to the immediate consequences of cervical removal for cancer I can speak with some certainty from my own experience. Whilst as to the probability of the subsequent recurrence of the disease in the uterus or elsewhere, even at possible risk of being deemed presumptuous in formulating an opinion from a comparatively limited number of cases, such as those in which I have been able to follow up the after-history of the patients thus operated on, I may here venture to summarise the facts at my disposal, and to mention the inferences that appear to me thus justified. In the first place, I have so far seen no mortality directly consequent on the operation. Secondly, of thirty-one cases in which I amputated the cervix for cancer or supposed cancer and was able to trace the result, in one instance the disease returned in the uterus

within four months, in five cases it returned there or elsewhere within a year, in two cases within two years, in one within three years, and in one the patient came back nearly four years after discharge from hospital with labial cancer. On the other hand, in ten cases there was no return of cancer within a period of four years, and I might mention that some patients I thus operated on more than ten years ago have since remained free from it. In five other cases the information procurable was limited to two years, and in six cases to one year after the operation, and indicated no recurrence of the disease within those periods.

These results may, I venture to think, be favourably contrasted with those obtained by the probably bolder, but not necessarily more successful, surgeons, who unhesitatingly, and as a general rule, advocate and practise the complete removal of the uterus in every case of carcinoma localised in any part of that organ. For, as just shown, the immediate mortality of the amputation of the cancerous cervix in my cases was *nil*. Moreover, of the patients so operated on two-thirds were apparently free from cancer at the end of the subsequent periods referred to, and, as far as I know, have since continued so.

The Method of Amputating the Cancerous Cervix which was followed in these instances is somewhat different from that more generally adopted, and may, perhaps, be here briefly referred to. With the exception of some instances, in which either supra-vaginal amputation or the vaginal flap operation with the knife was resorted to, in the great majority of cases I have relied on the infra-vaginal removal of the primarily affected neck of the womb either by the steel wire *écraseur* or by thermo-cautery. But, before this was done we invariably, in the former instance, trans-fixed the cervix above the supposed limits of disease by a steel wire ligature so as to prevent retraction of the divided

part, and to allow of its being drawn down for that subsequent thorough and deep cauterisation with the actual cautery of the stump, which, when the thermo-cautery had not been used for its separation, is, I think, always essential, and frequently successful in preventing any recurrence of cancer in the dense fibrous cicatricial tissues thus left. It need hardly be added that the necessary measures were taken to secure patency of the uterine orifice in these cases.

Hysterectomy for Uterine Cancer.—Having elsewhere discussed in detail the published statistics of the various operations for removal of cancerous uteri by vaginal and abdominal methods, I shall not here occupy time with these points. I fully admit, and in my own practice have recognised the fact, that in some instances—viz., either when the disease has distinctly originated in the fundus or body of the uterus, or as a palliative measure, in some advanced cases of uterine cancer—hysterectomy may be an unavoidable necessity. Nor can anyone for a moment question that its immediate mortality, more especially by the vaginal procedure, has been now reduced to a very small proportion of the cases operated on. None the less do I still maintain that these successful immediate results in no way represent the ultimate or curative consequences so obtained, and that they afford no ground *per se* for the adoption of those operations, as a general rule of practice, in the cases under consideration.

We have superabundance of statistics to show in how many cases of uterine carcinoma hysterectomy has been performed, and in how large a proportion of cases the patients were discharged, apparently convalescent, from hospital a few weeks afterwards. But before we can accept those statistics as any proof that the patients in question were cured by the operation, or even that they lived longer than would otherwise have been the case, the still imperfectly discharged onus of establishing these facts devolves

on those who rely so exclusively on such procedures. The accuracy of the published statistics of the results obtained in some cases where patients were considered as cured a few months, or even a year or two, after hysterectomy is in no way affected by the refusal to accept the conclusions thus arrived at. For if in such statistics be included, as is probably the case, the majority of instances of uterine cancer—viz., those in which the disease is located in the cervix—there need be no marvel, in the present advanced stage of intra-peritoneal and pelvic surgery, at the results so obtained. And I still venture to think that no less beneficial consequences, to say the least of it, might probably, as already shown, have been obtained with lesser risk by the timely removal of the affected cervix. But if, on the other hand, they refer to cases in which the upper regions of the uterus were extensively implicated by cancer, I must only confess my incompetence to realise how structures of such intense vascularity and intimate connection with lymphatic plexuses emptying into the vessels of the broad ligaments, as the fundus and body of the uterus, can long be the seat of cancerous changes without almost inevitable extension of the disease beyond possibility of capture by the surgeon's knife. Hence, under such circumstances the ultimately successful or curative results of hysterectomy must, I fear, be regarded as largely fortuitous and exceptional, although in some cases the fatal issue may possibly be thus staved off for a time.

Any probable extension of life and immediate relief from suffering are obviously justification of whatever measures may afford the best chance of such results. On these grounds, therefore, and merely as a palliative, I have, in compliance with the urgent solicitation of the patient, resorted to hysterectomy in a few—viz., in only five—of the many cases of carcinoma affecting the upper portions of the uterus that I have seen.

within the long period referred to. There are, of course, no definite conclusions to be drawn from so limited a number of instances, but I may, nevertheless, observe that in all but one of these exceptional cases of hysterectomy for cancer the patients recovered from the immediate effects of the operation, and were for a time relieved from their previous condition of misery. The ultimate results were, however, to a large extent in accordance with my anticipations. In one of these cases the disease returned in the bladder within five months, in another the patient died of disease of the spinal cord, which I believe to have been malignant, eighteen months later, and in only one was the patient alive, and apparently free from cancerous recurrence, at the end of two and a half years, when I last heard of her.

Palliative Treatment of Uterine Cancer.—In the majority of cases in which carcinoma uteri has not been recognised and removed before extension has occurred beyond its primary situation in the cervix, our chief function must, I fear, be the alleviation of suffering and the mitigation of symptoms. The methods by which those objects were attempted or accomplished in the inoperable cases of uterine cancer under my notice may be here recapitulated—first, with regard to the relief of pain and discharge, and secondly, with regard to the local applications by which an effort was made to arrest for a time the progress of the disease.

Relief of Pain in Inoperable Uterine Carcinomata.—Although I have found none of the newer hypnotics or analgesics, with the exception, perhaps, of orthoform, so promptly effective and reliable in giving ease to the pain of uterine cancer as the older fashioned preparations of opium, such as Battley and the acetum opii, I would venture to deprecate their too frequent exhibition in such cases. In the advanced stage of uterine cancer, when from the extension of the disease, more especially to the bladder or ureters, sedatives are most

likely to be required, opiates or morphin cannot be habitually efficiently used without such increase in their dosage as to derange the digestive functions, and the nervous system and thus probably accelerate the fatal issue. Moreover, under these circumstances I have noticed a special intolerance of the hypodermic use of morphin, and have seen what under ordinary conditions would have been a perfectly safe hypodermic injection of this agent followed by "that sleep which knows no waking." Hence, in the cases referred to, we have in the hospital, as a rule, endeavoured and generally succeeded in affording sufficient sleep and mitigation of pain by ringing the changes in succession in the various old and new analgesics as each in turn lose their effect. Amongst those thus employed were the bromides of potassium and sodium, trional, chloral, sulphonal, belladonna, conium, and lastly, the newest and probably one of the most generally useful pain allayers in uterine cancer cases—viz., orthoform.

Deodorisation of Cancerous Discharge.—As already observed, many patients in an advanced stage of uterine cancer suffer still more from the fœtor of the vaginal discharge than from the accompanying pain or hæmorrhage. The mitigation of this source of discomfort is therefore a matter of great practical importance in such cases. The mere frequent syringing with warm water, occasionally relied on, is, *per se*, almost useless for this purpose, whilst some of the deodorants, such as iodoform and ichthyol suppositories, sometimes prescribed, are only less offensive in their own odour than the discharge, the foetidity of which they are designed to mask. Nor is the desired object sufficiently effected by the ordinary antiseptic solutions of izal, carbolic or boric acid, &c. Of such agents one of the most effective that I have employed is peroxide of hydrogen—which, even for some hours after its use, leaves the patient

free from this horrible addition to her miseries. But, as the cost of this agent is a bar to its use by the poorer class of patients, in the majority of such cases we may be enabled to overcome the characteristic smell of cancerous vaginal discharges almost as effectively by the use of one or other of the cheaper as well as the best of all deodorants—viz., first, chlorate of sodium in the proportion of a couple of drachms to a quart of hot water; or secondly, by a one per cent. solution of formalin; and thirdly, by the use of turpentine. The latter can be thus employed by putting half an ounce of pure turpentine with a spoonful of magnesia into a quart of boiling water, and then pumping the mixture with the syringe from one vessel into another until the temperature will be reduced to blood heat, when the turpentine at the same time will be thus mechanically sub-divided, and will remain diffused through the fluid for a sufficient time to allow the vaginal passage to be washed out before the oil comes together again. No deodorant or styptic application in general use appears to afford more distinct respite from the fœtor as well as hæmorrhage of cancerous uterine discharge than this.

In some cases, however, similar effects can advantageously be produced by applying a small tampon saturated in a mixture of pure terebene and glycerine to the cancerous surface, where it may be left *in situ* for several hours.

I may now refer to some of the other local applications to which I have given a trial in these cases.

Methylene Blue.—More than five years ago I called attention to the value of this agent as a local analgesic in pruritus and other gynæcological cases, and since then I have frequently employed it in this way and by internal administration to relieve the pain of uterine cancer. In cases of inoperable cervical carcinoma a pledget of sterilised gauze saturated in a five per cent. solution of methylene blue will commonly not only allay pain but also cleanse and temporarily

improve the condition of the part, whilst the injection of a similar solution by the needle into the substance of a medullary growth will frequently for a time cause some apparent diminution of its size and a decided abatement in the amount and fœtor of the discharge.

Local Injections of Absolute Alcohol in the manner recommended by Schultz were employed in some of my inoperable cases of cervical cancer. In one of these the first injection of alcohol was followed by such intense local pain and constitutional disturbance as to prevent its repetition. In two other cases similar but deeper parenchymatous injections repeated at intervals of two or three days were attended with some diminution in the amount and fœtor of the discharge and apparent shrinkage in the diseased structure. But in neither of these cases did the patient remain sufficiently long under observation to warrant any conclusion as to the probable duration of these effects.

Greater Celandine or Swallow-wort, in the form of a liquid extract, which a few years ago was reintroduced as a remedy for cancer was, on the suggestion of my colleague Dr. Redmond, who was then trying it in other cancerous affections, employed in several of the cases of uterine disease of this class in my wards, and with results somewhat similar to those he obtained. In three cases in which the celandine was administered internally and applied locally, the condition of the cancerous ulceration was rapidly and distinctly improved for a time; in two no change was produced, and in none of them was any permanent or curative effect produced during the period the patients were under my observation.

Serum-therapy.—As the treatment of uterine carcinoma by the injection of the *Streptococcus erysipelatis* and other serums has been carefully investigated and unfavourably reported on by a Committee of the New York Surgical Society, and hence as there appeared to be no justification

for the further trial of these agents, they were not employed in any of the cases here referred to.

Potential Caution or Escharotic Treatment.—In cases where the disease is beyond possibility of removal by operation, or where it is apparently returning in the cicatrix after operation, or where by the destruction for a time at least of the cancerous tissues we may hope to afford relief from pain and discharge or to arrest hæmorrhage, and so prolong life and render death more easy, escharotics may in some instances be usefully employed. Of those which I have myself tried in such cases, including nitric and chromic acids, acid nitrate of mercury, ethylate of sodium, and chloride of zinc, I have found the last unquestionably the most effective, safest, and least painful, and have long since discarded other agents of this kind in any case of uterine cancer.

In some cases of extensive cancerous disease of the fundus or body of the uterus, and even when the cavity was filled and enlarged by the malignant outgrowth, and the patient's strength greatly exhausted by the accompanying hæmorrhagic and fœtid discharge and pain, I have succeeded apparently in prolonging life for a considerable time, and yet more distinctly in relieving the symptoms by thoroughly curetting away as far as possible the cancerous structures and freely cauterising the thus exposed uterine wall with chloride of zinc.

Actual Caution.—In two instances of advanced cervical cancer with glandular complications and considerable discharge and hæmorrhage, I destroyed the diseased surface by deep cauterisation with the actual cautery as a local palliative. In the first instance the eschar sloughed out, leaving a cleaner and comparatively healthy looking small ulcerated surface. In this case the cauterisation afforded marked relief from pain, hæmorrhage, and discharge as long as the patient remained under observation. In the second case no benefit was produced.

Electrolysis in Uterine Cancer.—As alternatives to the older escharotic methods the galvano-cautery or the negative electric current were also tried for a time in cases of carcinoma in my wards, on the strength of the success claimed for them by Drs. Apostoli of Paris, Byrne of Brooklyn, and Parsons of the Chelsea Hospital. The effects, according to the latter authority, produced by the passage of the current directly through the cancerous structure, consist of a cessation of growth, gradual subsidence of pain, shrinking and hardening of the tumour, followed by improved nutrition and improvement of constitutional condition. In the few cases in which I endeavoured to follow the directions published for the procedure some benefit was for a time evinced. But, possibly, from inexperience in the methods or insufficiency of perseverance, I was not myself enabled to secure the more marked and permanently good results hoped for from this practice in any of my own cases.

In conclusion, I have only to add that my clinical experience, extending over more than a quarter of a century in three hospitals, of the various measures there tried in the treatment of uterine cancer may be briefly summed up in the statement, that up to the present I know of but one generally feasible means of possibly curing this disease, and that is by its early recognition, and its timely and complete removal in the way which has been described in this communication.

DR. F. W. KIDD said there were many conditions which resembled the initial stage of uterine carcinoma. A microscopic examination was, therefore, always desirable. He had performed vaginal hysterectomy on 7 patients for malignant disease. Four of them, at least, he knew to be still alive.

SURGEON M'ARDLE said with reference to removal of the glands with the uterus and appendages, he had never yet seen thorough removal of the retro-peritoneal glands. In operations for tubercular

disease of the vermiform appendix it was his custom to rip up the peritoneum and remove the glands involved.

DR. ALFRED SMITH said sufficient stress was not laid upon rectal examination for the purpose of determining infiltration of the surrounding tissues. He thought that the best chance for the patient was offered by the abdominal method of operating, if there was any doubt about the case.

DR. PUREFOY said that when he recognised malignant disease in the uterus his inclination was to remove the whole organ.

DR. MORE MADDEN replied.

CASE OF POLYCYSTIC OVARIAN TUMOUR COMPLICATED BY ASCITES.

By R. J. KINKEAD, M.D.;

Professor of Obstetrics, Queen's College, Galway;
Physician and Gynæcologist to the Galway Hospital.

[Read in the Section of Obstetrics, May 26, 1899.]

MRS. N., nullipara, aged fifty, admitted to the Galway Hospital 30th June, 1898. It was impossible to get a reliable history; she, however, asserted that she only began "to get big within the year;" that there was no enlargement of the abdomen twelve months ago; she was sure there was no lump in either groin at the beginning, and she had been tapped three or four times. The latter statement was confirmed by the marks of the trocar. The heart, lungs, and kidneys were healthy, but, owing to the enormous distension of the abdomen, the size and condition of the liver could not be made out: there was no bile in the urine.

The characteristic ovarian expression was absent, face not emaciated, countenance cheerful. The abdomen immensely distended, umbilicus prominent, curve to ensiform cartilage gradual, that to pubes more abrupt than generally seen in ascites, though not more so than in two cases in which I had evacuated ascitic fluid a few days previously, fluctuation very distinct all over abdomen, which was dull on percussion in front, at sides, at right flank behind, and, although not so dull as the right, yet a clear note was not given over the left: the surface of abdomen was smooth, resistance seemed equal everywhere, no nodules or tumour could be felt.

It was clear that there was ascites, and the previous tapping pointed that way. Not being satisfied that it was only ascites I determined to make an exploratory incision and proceed further if necessary. On the 2nd July I operated, assisted by Professor Brereton and Dr. M'Kelvey. The patient having passed rapidly under ether, I commenced the operation at 12 noon by making a short incision down to the peritoneum, on nicking which clear ascitic fluid gushed out in a strong stream,

a trocar or canula was then introduced, it, however, struck on some obstacle within. I then slit up the peritoneum to the size of the external incision and exposed a tumour apparently covered by a muscular coat with large, distended veins ramifying on its surface: the incision was then extended up to a couple of inches above the umbilicus, when it was seen that the tumour was a huge ovarian cyst, and that the muscular layer terminated below umbilicus, being triangular in shape—apex above and the base below. There were numerous adhesions to the abdominal wall, especially at site of theappings, and also omental, some of which I separated, others had to be tied and cut.

I endeavoured to draw off contents of cyst with a Spencer Wells' trocar but failed, as before it passed in as far as the clips it struck on a resisting body inside the cyst. The patient was turned on her side and the cyst drawn up to the wound and the trocar withdrawn; as the contents were evacuated, the opening in the cyst was drawn well through the wound. Having emptied the cyst, the patient was turned on her back, and I slit it up and found close to the lower margin of opening a small cyst and immediately behind a very large one, which was tapped with a Spencer Wells' trocar, and as it emptied the mass was drawn by cyst forceps well up into the wound. The delivery of the cysts through the abdominal incision was taken charge of by Professor Brereton, while I separated pelvic and other adhesions; yet, when freed in front, above, below, and at the sides, it was still fixed, and it was only when I got my hand behind it that I found it was anchored in position by four cysts projecting from it, each as big as a foetal head, situated two on each side of the spine; and it was not until I got my hand underneath and dislodged these from their positions that we were able to lift the mass of cysts out of the abdomen.

The pedicle, short and thick, sprang from left side of the uterus, which was drawn up out of pelvis: notwithstanding that it was tied in three sections, on being separated from the tumour, two considerable sized arteries spouted; one I tied, the other was secured by the continuous suture with which I overran the cut edge of the pedicle (fully three inches wide), bringing the peritoneal edges together over the cut surface. The other ovary being diseased was also removed. The peritoneum was closed by a continuous suture of fine silk, and the abdominal wound by interrupted sutures of silkworm-gut.

At the termination of the operation the woman's condition was alarming; $\frac{1}{60}$ gr. strychnin and three syringefuls of ether were injected hypodermically: she was placed in a warm bed, the foot of the bedstead elevated, and an enema of beef tea with an ounce of brandy was administered. She rallied rapidly, and except for a stitch abscess convalescence was uneventful.

We were not able to catch and measure the ascitic fluid and that in the outer cyst; the fluid drawn from the inner cyst filled a metal slop bucket.

Immediate operation was necessary for the enormous distension. Another laparotomy case occupied the ward used for such patients. I was therefore forced to operate in one of the ordinary wards in which were various medical cases; this, of course, added considerably to the anxiety. Happily, however, she progressed as favourably as if she had been isolated.

DR. SMYLY expressed surprise that tapping should have been resorted to by those having charge of the case before Dr. Kinkead. He was of opinion that any medical man who tapped an ovarian cyst should be liable to prosecution for malpractice. The Spencer Wells trocar was one of those instruments which were quite useless, and it was impossible to keep it aseptic. The muscular coat which covered the front of the tumour, he thought, might have been the broad ligament.

DR. KNOTT related the case of a young woman suffering from a rapidly growing tumour. She was tapped, as they were very chary of performing ovariectomy in those days. The patient died finally of slow suffocation, and the necropsy, at which he was present, revealed a polycystic ovarian tumour extending up into the thorax.

DR. F. W. KIDD said he was called into consultation in a case of a very large ovarian cyst, and to relieve dyspnoea and to benefit the puerperium, the patient having been recently delivered, he advocated tapping, cautioning, however, the medical man in attendance that this was only a palliative measure. Over 30 pints of fluid characteristic of an ovarian cyst were withdrawn. He was able to state that the cyst did not fill again, and that the patient had completely recovered.

NOTES ON A SUCCESSFUL CASE OF CÆSAREAN SECTION.

By FREDERIC W. KIDD, M.D.;

Master, Coombe Hospital.

[Read in the Section of Obstetrics, May 26, 1899.]

THE reason I am bringing this case before you in the form of a short paper is twofold. First, because such cases are in themselves of sufficient importance and rarity, and on that account worthy of being placed on record, so that the indications for the operation, and the treatment adopted, may be fairly criticised. Secondly, that attention may be drawn to any procedures in the operation, which, on mature consideration, after the operation may have seemed faulty, although at the time of the operation they may have not seemed so owing to its having been an operation of emergency, performed by gas-light, in the middle of a winter's night.

The usual "absolute indication" for Cæsarean section arises in the following cases:—When there is a living child with flattened pelvis, having conjugate diameter of 6·5 ($2\frac{5}{8}$ inches) centimeters or less; or a generally contracted pelvis of 7 to 7·5 centimeters; and in case the child is dead in a pelvis measuring 4·5 centimeters ($1\frac{3}{4}$ inches) or less; also when any pelvic growth has caused the diameters to be diminished to this extent; and lastly, in cases where the pelvic measurements may be normal, and some inflammatory exudation around the uterus and vagina, or new growth in the tissues of the lower uterine segment, have brought about a similar condition. The case I bring under your notice belonged to the latter category. The history was as follows:—

CASE.—A. O'M., primipara, aged thirty-two, was visited at her own home on Saturday, the 3rd December, 1898, by one of the students from the Coombe Hospital. She had come to her full time, and had pains similar to labour pains. On examination it was found that the cervix was drawn up, and that there was a tumour extending posteriorly, wedging itself, so to speak, in the pelvis. The Assistant Master's attention was drawn to the case, and he promptly had her conveyed to the Coombe Hospital. On my return from the theatre I went to see the patient; the labour pains had more or less disappeared, and on examining per vaginam the following condition was observed:—Cervix was soft, especially anterior portion, patulous so as to admit two fingers, was displaced forwards close to pubis, posterior wall very convex, caused by hard growth springing from body of cervix, which also caused enlargement posteriorly towards promontory of the sacrum; it was regular in outline and palpably a fibroid growth, seemingly about the size of a turkey egg. The head of the child was displaced forwards on to the ramus of pubis, and towards the left side. Endeavour was made if by any means the cervix and tumour could be raised up, so that tumour might ascend above the brim of the pelvis; this, however, was found impossible owing to the fact that the tumour started from the cervix itself. There seemed only two possible alternatives by which the woman could be delivered—either to perform Cæsarean section or to attempt to remove the growth that blocked the pelvis by morcelllement; the latter alternative was speedily dismissed, as it was impossible to determine how far up the growth might extend posteriorly. The case was a favourable one for Cæsarean section, owing to the facts that the child seemed strong (fœtal heart before operation beat at rate of 134), the membranes were unruptured, and whatever labour pains there may have been there was no evidence of any formation of retraction ring. The usual preparations for operation not being possible, the patient had a rectal enema of soap and water, vagina was carefully douched with creolin solution, and immediately before the operation a stimulating enema with brandy was administered; the abdomen was carefully washed with carbolic soap and water, pubes shaved, then washed with strong solution of corrosive sublimate. I was assisted in the operation by Dr. Heuston, Drs. Cole-Baker, Scully, and Neill, while to Dr. Stevens was entrusted the duty of administering to the wants of the child the minute the cord was cut. The

abdominal incision extended about two inches above the umbilicus to a point about three inches above pubis, and was six inches in length, and the uterus was reached immediately. On incising the uterus it was found that the placenta was attached beneath the line of incision; placenta not cut through, but uterine incision was enlarged immediately, so as to admit the hand, and then placenta was separated over to the left side, and membranes incised. There was a difficulty in getting hold of both lower extremities of child—in fact it was only when one was delivered that the second extremity was brought out; and here I made an error in not having made my incision sufficiently large in the uterus itself, with the result that I tore the uterine tissue at the upper end of the incision, the tear extending in an oblique direction for perhaps a distance of two inches; even with this delay the child was delivered in about two minutes from the time of the first incision. The approved method is to deliver by traction on both feet together. Dr. Heuston controlled the hæmorrhage from the uterus by pressure with his hands; the child was partially asphyxiated when born, and was taken by Dr. Stevens; the placenta was then removed as speedily as possible with the membranes, and it was not until the sutures were being inserted into the uterine tissue that any efficient contraction was set up; the cavity of the uterus was quickly cleaned with sterilised gauze sponges, but no time was wasted in picking small pieces of decidua away. There was a very considerable amount of hæmorrhage, due more to the size and situation of the placenta rather than to the torn portion of the uterus. The placenta, which in ordinary cases measures about 7 inches by 6 inches, in this case measured 11 inches by 7 inches, and was situated on anterior and right side of uterus forming what is styled by Kelly the placenta-prævia-Cæsareana. Examination afterwards proved that very slight injury had been done to the placenta in incising the uterus. The upper or torn part of uterine aperture was then carefully sutured by interrupted silk sutures, which penetrated as nearly as possible the whole depth of the muscle without involving the mucous membrane. When all the deep sutures had been passed, superficial ones of a finer silk were passed, drawing peritoneal covering of uterus as well as possible over the line of incision. Parietal peritoneum was then sutured with continuous suture of fine silk, after silkworm-gut sutures had been passed through entire

tissues of abdominal wall; these latter were tied after peritoneum was stitched; wound was then dressed in the ordinary way—with iodoform gauze, strips of adhesive plaster and sterilised pad and binder—and patient was removed to bed.

There was no cleansing of the general cavity of the peritoneum required in this case except what could be taken up by two or three sponges, nor was there any rubber ligature passed round the neck of the uterus.

The child (a male) was Schultzed by Dr. Stevens, and seemed to recover in about 10 or 15 minutes, but never cried lustily, was about $7\frac{3}{4}$ or 8 lbs. weight when born (owing to some mischance the routine procedure of weighing the child was omitted).

The recovery of the mother was, comparatively speaking, uneventful; she was not allowed to attempt to nurse, although this is advocated by many authorities; the reason was that she was very debilitated by the loss of blood, and at no time was a robust woman. I here submit a four-hour temperature chart for the first fortnight of her convalescence, and it will be seen that the temperature never touched 100° F. Patient developed bronchitis the day after operation, which gradually yielded to treatment. Bowels were moved on 3rd day after calomel 5 grs. and sulphate of sodium. Lochia became rather scanty and pale after 3rd day, such as is often observed in cases of P. P. H., but returned more free about the 7th or 8th day; never any fœtor. Pulse remained above 80 until the beginning of 5th week.

With regard to the child I regret to say the result was not so favourable; it was always weakly, was fed by spoon, and frequently got brandy; it had a slight convulsive seizure on the 2nd day, and died on the evening of the 3rd day; it had vomited occasionally, and the vomit exhibited appearance as though it resembled coffee grounds, or blood that had undergone change in the stomach; its muscular system had always been in a condition of contraction, abdomen quite hard, and none of the muscles of extremities ever seemed relaxed. Having obtained permission Dr. McWeeney made a most exhaustive autopsy, and only found that there were numerous small intestinal intussusceptions, such as often occur in infants during the death agony; he also found traces of hæmorrhage from the lower end of the œsophagus; this, to my mind, explains the coffee ground vomiting, and opens up the interesting question as to whether this

might have been caused by the endeavours to resuscitate the child, even though it be performed by a skilled hand, and that Schultze's method and not Sylvester's be adopted.

The abdominal stitches were removed on the 8th day, when the wound, which was then dressed for the first time, was found perfectly healed.

At the time of the operation the tumour was felt filling up brim of pelvis posteriorly, and if any attempt to deal with it at the time were made nothing could have been done but a panhysterectomy; this was deemed inadvisable owing to the weakened condition of the patient, and the lingering hope that the tumour might be removed subsequently per vaginam. Looking back, I now regret that I had not adopted the precaution of either removing the ovaries, or, as has been advocated and practised by Dr. Murdoch Cameron, of Glasgow, tying both the Fallopian tubes.

Subsequently, having the patient under an anæsthetic, I had the advantage of the advice of Dr. Smyly as to any operative procedure for the removal of this tumour. On examining the patient it was found that as the uterus involuted the tumour had come down with the uterus until it filled up the hollow of the sacrum; it was evident that as the uterus had increased in size with advancing pregnancy it had drawn up this tumour as high as it possibly could. The tumour now felt so near the examining finger that the simplest method seemed to attack it from the posterior cul-de-sac, but Dr. Smyly disapproved of this method for the reason that it was evident that there was some adhesion of the uterus to the abdominal wall anteriorly, and in such a case he dreaded that some hæmorrhage might occur which could not be efficaciously controlled unless the uterus would come down, and this it could not do on account of adhesions. He advised, if any operative procedure be adopted, that it should be removed by means of an abdominal section. The patient, however, refused operation. I have seen the patient this week; her condition is remarkably good, she has regained her strength and colour; the abdominal incision is everywhere as firm as possible; it now only measures $4\frac{3}{8}$ inches, the portion above umbilicus measuring barely an inch. She has no symptoms indicating operation, menses occur perhaps a little more profuse than formerly, cervix is pushed forward and upward and is found just about the top of the symphysis. According to many

authorities the procedure that should have been adopted was Perro's operation; however, the reasons why Cæsarean section was adopted have been already given.

I take this opportunity for thanking the gentlemen who so kindly assisted me at the operation, and I hope that the members of this Section of the Academy may not think that I have taken up too much time in placing the details of this case before them.

DR. SMYLY remarked that every step of the operation, though apparently a simple one, was the subject of controversy. Professor Murdoch Cameron, of Glasgow, has said that the position of the child depended on the placenta, and he would like to know if this opinion was borne out in this case, and if the abdomen of the child was turned towards the placenta.

DR. PUREFOY said that, though a recent writer had advocated the low incision in preference to the fundal incision, his own experience had led him to think that the high incision was certainly the better. He thought that the careful application of the sutures and adjustment of the peritoneum had a great deal to do with the success of a case. He had always regarded Schultzing with misgivings, owing to the possibility of injury to the soft parts of the child.

DR. TWEEDY did not see the necessity of avoiding insertion of the ligatures right through the endometrium if the uterus were aseptic, and this method gave a firmer union in his opinion. Lusk says that an incision is made low down in the uterus in order to avoid hæmorrhage, whereas it has been recently claimed that an incision through the fundus, the most muscular portion of the uterus, obviates much hæmorrhage.

DR. KIDD, in reply, said the child was very nearly in the left occipito-anterior position, and the placenta was more over to the right of the mother. He was not opposed to Schultzing, and he thought that Sylvester's method was far more likely to cause hæmorrhages. With regard to the question of suturing, he had no guarantee that the uterus was aseptic in this case.

MR. LENTAIGNE ON CARTILAGINOUS TUMOUR OF THIGH.



Some portions of cartilaginous tumour of thigh removed by morcelllement.

SECTION OF PATHOLOGY.

LARGE CARTILAGINOUS TUMOUR OF THIGH REMOVED BY MORCELLEMENT.

By JOHN LENTAIGNE, F.R.C.S. ;
Surgeon to the Mater Misericordiæ Hospital.

[Read in the Section of Pathology, November 4, 1898.]

MR. LENTAIGNE exhibited portion of a cartilaginous tumour which he had removed by morcellement from the upper portion of the front of the thigh of a patient, on 30th Sept., 1898. The portion of the tumour exhibited weighed over three pounds, and represented only part of what had actually been removed, the remainder having unfortunately been lost. It consisted of nodular masses of cartilage, varying in size from a walnut to a bean. In structure these masses somewhat resembled pieces of the head of a cauliflower. There were also masses of spongy bone more or less mixed with cartilage, and some few composed of bone only.

History.—The patient, a man aged about forty-five years, came to the Mater Misericordiæ Hospital in September, 1898, complaining of chronic swelling of the upper end of the right thigh. He said that this swelling had been coming on him for more than 12 years, but that lately it had greatly increased in size. He was somewhat alarmed at it, but his chief reason for coming to hospital for treatment was the interference with locomotion which the tumour caused. Its bulk was so great that he found it difficult, he said, to walk, much less to carry on his ordinary work. The tumour itself felt extremely hard, it was somewhat nodular and apparently was quite fixed, and intimately connected with the femur.

The skin was movable over it, and was quite healthy. It occupied the upper two-thirds of the right thigh, and the swelling was mainly on the front and outside of the limb, which seemed to be more than double the size of the sound limb.

A skiagram showed the femur apparently normal in outline, except at and immediately below the trochanters, where some dense tissue-like bone, but not so dense as the shaft of the femur, seemed to extend outwards and forwards into the tumour.

Unfortunately, neither photograph nor measurements of the tumour were taken.

Mr. Lentaigue removed the tumour by morcellement on September 30, first making a long vertical incision on the anterior and outer aspect of the limb. The soft parts were dissected off a large portion of the tumour, and the substance of the tumour was dug out in pieces with sharp gouges. The only difficulty lay in the removal of that part which lay under the femoral artery, which ran through a deep groove in the front of the mass. The outer portion of the tumour was pure cartilage, the inner portions were partially composed of bone, and near the shaft of the femur it was altogether composed of bone, which had to be cut away with chisel and mallet. The tumour was almost bloodless, very little blood being lost during the operation. The result was excellent. The wound healed at once, and the patient had been able to leave his bed on the 12th day. The tumour seemed to belong to the class described as spongy or cancellous exostoses. In it, however, the cartilaginous tissue greatly predominated; this growth was however found to be springing from the femur by a broad and diffuse origin involving the front and outer side of the upper portion of the shaft, and was not pedunculated as these spongy exostoses usually were. Mr. Lentaigue had never seen any case like it before.

TUBERCULOSIS OF IRIS AND CHORIOIDEA.

By A. C. O'SULLIVAN, F.T.C.D.;

Lecturer on Pathology, Trinity College;

AND

J. B. STORY, F.R.C.S.;

Surgeon to St. Mark's Hospital;

Professor of Ophthalmic and Aural Surgery, Royal College of Surgeons.

[Read in the Section of Pathology, November 4, 1898.]

THE specimen was taken from a boy, aged seventeen, who was admitted into St. Mark's branch of the Royal Victoria Eye and Ear Hospital, in April, 1898. The history received was that the soreness of the eye dated from a blow on it some five months previously.

The eye exhibited a pink circumcorneal vascularity, and a yellow tumour in the anterior chamber, growing from the upper and inner angle, springing from the iris, and apparently adherent to the cornea. It extended about one-fourth the diameter of the cornea towards the centre, was nearly circular in shape, and extremely vascular. In fact, it had quite a pinkish colour from the number of minute vessels running over its surface, though the ground colour was as yellow as that of a collection of pus. Its apex, indeed, appeared either purulent or caseous. In the cornea proper there were two other distinct infiltrations along the horizontal diameter, about half way between the centre and the periphery. The iris was discoloured, and the fundus could not be illuminated. Diagnosis was tuberculosis of iris, and probably of ciliary body also.

After enucleation the pink colour entirely disappeared, and the tumour looked just like a mass of pus.

On cutting the globe open the tumour was found spring-

ing from the ciliary body, and pressing upon the lens behind, and the cornea in front.

It occupied the situation of the anterior part of the ciliary body, and about one-third of the iris, and was about half an inch by one-fifth of an inch in size. At the opposite side the iris was bulged out, leaving a transparent cavity, and passing towards the tumour the tissue of iris and ciliary body became considerably thickened.

Microscopically the tumour and the thickened portions of the iris and ciliary body were seen to consist of tubercular tissue. The ciliary part of the retina on the same side was also infiltrated with cells. The bulging of the iris was a cystic dilatation between the muscular tissue and the uveal layer. There was slight cell infiltration of the cornea on both sides, which was continued into the sclerotic, and on the side opposite to the tumour there was a tubercular nodule between the uveal pigment and the lens capsule, close to the ciliary processes. The anterior chamber contained some cellular exudation. In the retina, about the equator, at the side opposite to the tumour there was a nodule occupying the whole thickness of the retina, and causing it to bulge towards the chorioid. This nodule was composed of lymphoid cells with oval nuclei like those seen in endothelium, and the cells very much resembled those found in the second case. The iris was irregularly thickened, the outer coats of the vessels thickened and hyaline, and in one section a nodule of tubercular aspect was found similar to what was seen in the retina. The optic nerve and other tissues examined showed no pathological changes.

TUBERCULOSIS OF RETINA.

By A. C. O'SULLIVAN, F.T.C.D.;

Lecturer on Pathology, Trinity College;

AND

J. B. STORY, F.R.C.S.;

Surgeon to St. Mark's Hospital,;

Professor of Ophthalmic and Aural Surgery, Royal College of Surgeons.

[Read in the Section of Pathology, November 4, 1898.]

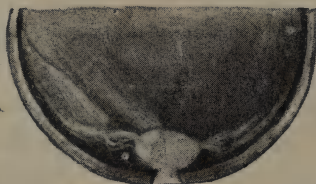
THE specimen was taken from a healthy-looking, well-developed girl of twenty-one, who was sent to me by my friend Dr. Powell, of Roscrea, in February, 1898. The only history to be obtained was that a cloud came over her right eye three months previously, and that it came on in one night. Her health was good, and had always been so, and there was no sign of disease or dyscrasia.

On examination the pupil of the right eye only acted consensually, and the vision of that eye was reduced to counting fingers, and that only in the nasal side of the field. The left eye was normal in all respects. Ophthalmoscopically the right eye presented the appearances of an intense papillitis, but differing from any such inflammation I have ever seen in the brilliant whiteness of the papilla, and in the extreme swelling, which was more marked than in any case in my past experience. The prominence and the whiteness combined made the appearances much resemble those seen in detachment of the retina. The blood vessels, however, in the distended whitened papilla were tortuous and dilated, and there were small white spots in the retina about the macular region. A definite diagnosis was not made at that time, but when I saw the case again in April we diagnosed tuberculosis, and persuaded the patient to allow the globe to be removed. In April she said the eye had been inflamed for a fortnight, and there was a pink circumcorneal vascularity, a discolouration of the iris, and an external strabismus. Tension normal, and vision just perception of light.

After hardening the globe the following conditions were found :—

At the posterior part of the retina, for some distance round the entrance of the optic nerve, there was a tumour one-third of an inch in diameter, and about one-fifth inch in depth. For some distance on both sides of this tumour the retina was detached, and a firm coagulum of a homogeneous appearance lay between it and the underlying chorioid coat. On examining the section with the microscope, the tumour was seen to be composed of typical tubercular tissue containing numerous small round cells, larger irregular cells and giant cells. It was traversed by strands of connective tissue containing blood vessels, and showed a slight caseation in parts.

This tissue passed over without a break into the inner layers of the retina, which contained much larger vessels than usual, and in which were scattered numerous small nodules containing lymphoid and endothelioid cells in a reticulum,

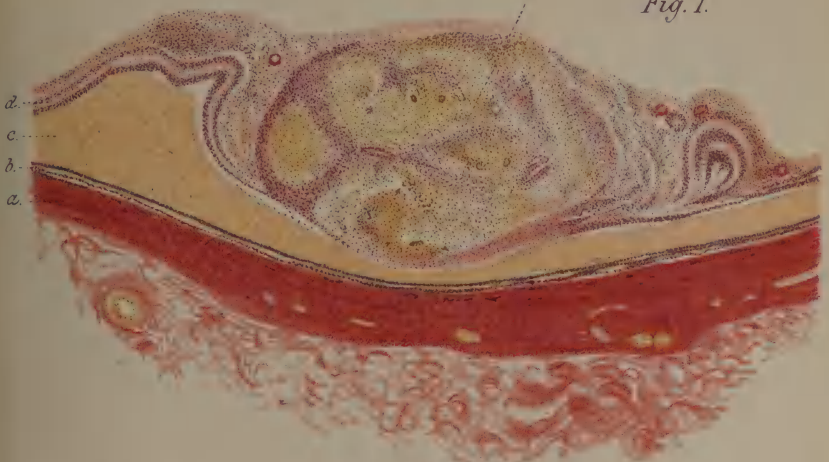


The illustration shows the microscopic appearance of the tumour on cutting open the globe.

which caused the retina to bulge in towards the vitreous, and were no doubt tubercular in character. The tubercular tumour was separated from the chorioid by the coagulum before mentioned, which under the microscope showed a homogeneous appearance, and stained like the colloid material of the thyroid gland.

Behind this material all round lay the outer or pigmentary layer of the retina, and then the chorioid, so that the so-called retinal detachment is really a separation of the retinal layers by the exudation.

Fig. I.



a. sclerotic. *b.* choroid, with pigmentary layer of retina attached.
c. colloid material between choroid and detached retina.
d. detached retina. *e.* tubercular mass in the retina with caseation and giant cells.

Fig. II.



a. b. c. d. as before. *b'.* pigmentary layer of retina.
e. tubercular nodule. *f.* giant cell.

The optic nerve behind the globe was, microscopically, perfectly normal. The disease evidently was spreading from the papilla to the anterior portion of the uveal tract, and not backwards.

Localised tuberculosis of the uveal tract is not a very uncommon occurrence in ophthalmic literature. Many cases have been recorded, and the first case of the present communication only adds another to an already extensive series.

Localised tuberculosis of the retina is, however, a very rare occurrence indeed, and it appears probable that the second case described is actually the first recorded of a purely ophthalmoscopical diagnosis of such a condition. Tuberculosis of the optic nerve, with or without implication of the retina, has been described in a small number of cases. In all cases of localised tuberculosis of the eyeball it is very difficult to determine whether the disease is a primary intra-ocular affection or merely secondary to tuberculosis elsewhere. In most of the recorded cases the eye affection was undoubtedly secondary, and in the remainder of the cases it is almost impossible to prove that it was not secondary. In the case here described the disease appears to be primary, but it would be rash to make a positive assertion on the subject.

A very interesting case is recorded by Sattler in *v. Graefe's Archives*, XXIV. 3, p. 127. It shows what would probably have been the result in our case if the eye had been left in the orbit for some months longer. Sattler's patient was a boy of five, who came to Arlt's Clinique with proptosis, distended eyelids, restricted ocular movements, and chemosis. Evidently there was an orbital tumour present, and that it had implicated the optic nerve itself was to be inferred from the appearance of the papilla and retina, which was almost identical with what was seen in the case which forms the subject of this communication. The papilla and surrounding retina were occupied by a white tumour projecting into the vitreous, and covered with enlarged and tortuous arteries and veins. There were no hæmorrhages, there was no pain, the globe was becoming phthisical, and vision was lost.

Enucleation was followed by local suppuration. (Case occurred in 1876). Death occurred five months afterwards from tubercular meningitis.

Tubercular disease was found in the whole tract of the optic nerve and its sheaths from the chiasma to its intra-ocular expansion, besides infiltration of the orbital tissues, and miliary deposits in the retina. Sattler is inclined to regard the case as secondary to tubercular disease which was present in the bronchial glands.

Cirincione records a case of tuberculosis of the orbital part of the optic nerve (referred to in Michel's *Jahresbericht of Ophthalmology*, 1890, p. 181). The patient, aged eleven, died of basilar meningitis, and there was found in the orbit a tumour of 14 by 17 mm. springing from the nerve, and of tubercular nature. The origin was thought to be a caries of the upper orbital border which had existed for two years previously.

A tubercular nodule in the optic nerve is described by Demours (*Traité des Maladies des Yeux*, 1818, T. 1, p. 75); and Cruveilhier records the presence of a similar condition in a case of tubercular basilar meningitis (*Traité d'anat. path. gèn.* T. IV., p. 793). Demours' case died of chronic lung disease, and Cruveilhier's had deposits in apices of lung.

Tuberculosis of the optic nerve complicating tuberculosis of the uveal tract is described by Wagenman, v. Graefe's *Archives* XXXIV. 4, s. 178, and Bongartz', *Inaug. Dissertation* (referred to in Michel's *Jahresbericht of Ophthalmology*, 1891, p. 165). In this case the retina and optic papilla were the parts affected, and there was disease of the apex of left lung. In Wagenman's case, a girl of sixteen enucleated in Professor Leber's Clinique in 1874, the patient was alive and well fifteen years after the operation.

Our patient is reported by Dr. Powell to be in good health now, some 18 months after the operation, only somewhat thinner than she used to be, and with a pain in the back of her head, which gives her some trouble.

One of her uncles died of meningitis, and another maternal relative of consumption.

BICUSPID AORTIC OPENING.

By HENRY C. DRURY, M.D. (DUB. UNIV.), F.R.C.P.I.;

Assistant Physician, Sir Patrick Dun's Hospital ;

Physician, Cork-street Fever Hospital.

[Read in the Section of Pathology, November 4, 1899.]

DR. H. C. DRURY exhibited the heart of a man aged about fifty-five years, showing only two valves at the aortic opening. The condition of the heart during life was unknown, as the patient was admitted into hospital in a dying state, and lived only a few hours. There was atheromatous thickening of the aortic valves which rendered them incompetent; also some atheroma of the aorta above them. The other valves of the heart were normal, the pulmonary opening having three normal, healthy cusps. Though there was atheroma of the aorta and its valves, it is probable that the bivalved condition was congenital, and not acquired by any adhesion of two valves, and the subsequent absorption or ulceration of their joint attachment to the aorta, because (1), the valves were approximately equal in size, and very large; (2), there was no evidence in either valve of a line of union. Their positions were—one, to the right and slightly posterior; the other, to the left and slightly anterior: the slit between their free edges being directed from before and a little to the right, backwards and a little to the left. The right valve appeared to represent the normal right posterior and half anterior valves; the left representing the normal left posterior and half anterior valves. There was a coronary opening behind each, the right coronary being situated behind the anterior part (half anterior valve) of the right valve; the left coronary behind the posterior part (left

posterior valve) of the left valve. There was a distinct ridge behind the right valve, making a larger posterior and smaller anterior sinus in the aortic wall; from the smaller anterior sinus the right coronary artery arose. As there was atheromatous disease present it did not appear quite clear whether this ridge was due to atheroma, or represented the normal division between the anterior and right posterior sinuses of Valsalva, but judging from its position with respect to the right coronary opening, the latter view appeared to be the more probable. There was no marked subdivision of the aortic wall behind the left valve.

SPECIMENS OF PATHOLOGICAL HEARTS.

By JAMES B. COLEMAN, M.D., F.R.C.P. ;

Physician to the Richmond, Whitworth, and Hardwicke Hospitals, and to the
National Hospital for Consumption for Ireland.

[Exhibited in the Section of Pathology, November 4, 1898.]

THE hearts which I exhibit were taken from patients who died in the Whitworth Hospital during the present year, and some of them may be found to possess points of clinical or pathological interest.

Pure Aortic Stenosis—This is the most perfect specimen of aortic obstruction which I have ever seen. The patient was a woman, aged fifty, who never had rheumatism or syphilis; she had always been healthy up to nine months before her death, when she suffered from frequent attacks of severe pain in her chest. She died suddenly, having been found dead in her bed one morning. I did not see the patient during life. The heart (exhibited) was very slightly enlarged; left ventricle was enormously hypertrophied, but not dilated; aortic valve showed extreme stenosis, there being a mere sinuous chink for the passage of the blood; there was no insufficiency. The anterior and left posterior aortic segments were fused, thus forming a *bicuspid aortic valve*. The segments were sclerosed, thick, calcified, and nodulated, and so closely and rigidly adapted to each other that a fine probe could be introduced between them with difficulty. Pure aortic stenosis (without regurgitation) was not common, and it was often described as the least serious of the valvular lesions; nevertheless in this case it produced sudden death.

Aortic Insufficiency.—As a contrast with the last case I show a specimen of aortic insufficiency. The patient was

a man, aged thirty-two, who had rheumatic fever twelve years ago, and syphilis four years later. He did not suffer from cardiac symptoms till three months before his death. On admission to hospital he had dyspnœa, palpitation, and œdema of his legs. On examination he presented the signs of aortic obstruction and regurgitation, with well-marked *bruit de scie*. The diastolic murmur was very loud and long, musical in tone, and it was heard all over the cardiac area, and in the upper part of the left vertebral groove; this murmur was accompanied by a diastolic thrill, which was perceptible along a line extending from the second right cartilage to the third left cartilage; the thrill was easily felt when the ulnar edge of the hand was applied obliquely across the sternum between the cartilages mentioned. The patient died with symptoms of heart failure and general dropsy. The heart (exhibited) weighed 21 oz.; there was marked hypertrophy and dilatation of the left ventricle; the aortic valve was incompetent; the cusps retained their normal shape, but they were hard and so shrunken as to form only a fringe around the orifice; between two of the cusps there was a large vegetation. The cause of the musical diastolic murmur and of the diastolic thrill was probably the tension and vibration of the edge of the cusps standing out in the reflux blood stream.

Ulcerative Endocarditis ; Valvular Aneurysm.—The patient was a man, aged eighteen years, who never had rheumatism. On admission to hospital he complained of palpitation, cough, and hæmoptysis; his temperature was 101°, and his pulse (124 per minute) was “water-hammer”; he had typical signs of aortic stenosis and patency, and of mitral patency. The diagnosis was old-standing valvular disease with an acute attack of endocarditis superadded. The heart (exhibited) was enlarged, the left ventricle being

hypertrophied and dilated. There were vegetations around the mitral valve. The aortic valve was incompetent; the right posterior segment showed an aneurysm; its ventricular surface was ulcerated and covered with warty projections; the other aortic segments were retracted and sclerosed.

Mitral Stenosis and Insufficiency; Hypoplasia of Aorta.—

This specimen was taken from a girl aged twenty-four, who had rheumatic fever when nine years of age. She suffered from cardiac symptoms for the last twelve years. On admission to hospital she complained of cough, dyspnoea and palpitation. On clinical examination, the cardiac impulse was displaced downwards and outwards; over the mitral area she had a loud systolic and a faint post-diastolic murmur; there was also an aortic systolic murmur, and accentuation of the pulmonary second sound. Her pulse was 44 to 48 per minute, small and irregular. The heart (exhibited) showed hypertrophy and dilatation of left ventricle, and great enlargement of the right side. The mitral valve was stenosed and incompetent. The aortic cusps were not diseased, but the aortic orifice was very small, and the aorta itself was much narrowed, so that the little finger could scarcely be introduced into it. The diameter of the pulmonary artery was double that of the aorta.

∴ *Hypertrophy and Dilatation.*—The patient was a painter, aged fifty, who was admitted to hospital with general dropsy and oedema of his lungs. His heart (exhibited) weighed 34 ounces, and was a veritable “cor bovinum.” The valves were normal. The kidneys were granular, and the enlargement of the heart was obviously due to the chronic Bright’s disease.

A CASE OF SEPTICO-PYÆMIA ORIGINATING IN ACUTE SUPPURATIVE ARTHRITIS.

By E. J. McWEENEY, M.A., M.D. (R.U.I.), L.R.C.P.I.;
Professor of Pathology and Bacteriology, Catholic University Medical
School, &c.

[Read in the Section of Pathology, November 4, 1898.]

THE patient a boy aged twelve, sustained a slight blow on the right knee from the swinging-bar of a trapeze. Four days later he was admitted to the Mater Hospital under the care of my colleague, Mr. Lentaigne, with high fever and delirium. The knee was swollen and tender, but showed no trace of external injury. The joint was opened, a large amount of turbid, almost puriform, fluid evacuated, and the cavity washed out and drained. Next morning the temperature had fallen, but the patient seemed very weak, and developed pericarditis. Next day the temperature ran to 106° , with asthenic delirium, and the patient sank. At the autopsy the points of interest noted were—purulent infiltration of the soft parts surrounding the joint; an ecchymosis as big as a half-crown over the front of the inner condyle; a thin layer of purulent matter covering the crucial ligament; no suppuration of the lower epiphysis or diaphysis of the femur; no thrombosis of the popliteal vessels. There was acute sero-fibrinous pericarditis, with suppurative myocarditis occurring in isolated foci as big as a pea in various parts of the myocardium, some of the foci being embedded in the muscle, some abutting like infarcts on the epicardium, and evidently of embolic origin. The lungs showed numerous septic infarcts, as did also the kidneys. There was incipient acute pleurisy on both sides.

The case was evidently one of extremely acute generalised septic infection, starting from the knee, which had

apparently become a *locus minoris resistentiæ* owing to the slight injury. The bacteriological examination revealed *Staphylococcus aureus* in the fluid removed from the knee at the time of operation, and also in the pericardial fluid; also in the foci in the lungs, myocardium, and kidneys. How it had obtained entrance was not clear. The speaker demonstrated the cultures, and a series of microscopic slides, stained by the Weigert-Gram method, showing the cocci in the various organs. No other organism was present. Exhibitor also showed a preparation, made from his own finger, which had become infected at the autopsy without any wound, apparently along the shaft of a hair on the dorsal aspect of the second phalanx. In spite of active treatment a troublesome furuncle resulted, the slough from which swarmed with the *Staphylococcus aureus*. There was some lymphangitis, but he had fortunately escaped without glandular infection.

ABDOMINAL ANEURYSM IN A YOUNG WOMAN.

BY R. CHARLES B. MAUNSELL, M.B., &c.;

Surgeon to Mercer's Hospital, Dublin.

[Read in the Section of Pathology, December 2, 1898.]

CASE.—M. G., aged thirty-seven, married, was admitted to Mercer's Hospital, under my care, September 22nd, 1898. She complains of wasting, pain in the epigastrium, dorso-lumbar region, and around left side. The pain is constant and sometimes very severe, and is increased by food. She states that she vomits if she attempts to take anything except a little hot rum. She never noticed blood in the vomited matter. For some months she has noticed a lump which, she says, "rises and jumps in the pit of my stomach." About a year ago she weighed over nine stone. She has been married nineteen years, had a healthy child one year after marriage, then a miscarriage some years after, and then two dead-born children—the last two years ago. She was then treated at the Coombe Hospital for displacement of the uterus. For the last year she has not menstruated, and during this time she had several attacks of bleeding from the rectum, the last about three months ago, when she says she lost a large amount of blood. The pain in epigastrium commenced six months ago, increased three months ago, and has been constant for the last three weeks. She has had attacks of vomiting for two months.

Present condition—Temperature and pulse normal; urine, sp. gr. 1023, acid, no albumen or sugar; weight, 6 st. 13 lbs.

Inspection—She is anæmic, chest and apex beat normal, abdomen lax and hollow except to the left of epigastric region, where an indistinct fulness and pulsation can be seen.

Palpation—Chest, &c., normal, tenderness over fulness and to the left over stomach. On light palpation a rounded tumour about the size of a goose egg is felt commencing at the left of middle line, and, passing under left costal margin at level of eighth cartilage; it pulsates, and gas can be felt gurgling through it at intervals during manipulation. On deeper pressure a firm,

round lump about the size of a small hen egg can be felt distinctly to the left of middle line, as if it lay in the centre of the larger and softer tumour. It is very tender, and pulsates with a strong distensile pulsation laterally, but cannot be well defined vertically as the recti become tense. It appears to be very fixed.

The aorta can be easily palpated as a firm pulsating tube, smaller and more to the left than normal. The pulse in iliacs and femorals seems normal.

Pelvis and rectum normal, except for fixed retroverted uterus and very slight hæmorrhoids.

Percussion—Stomach tympany extends higher than normal in left axillary line. Dulness over area of larger tumour.

Auscultation—Slight hæmic bruit over pulmonary area, slight accentuation of aortic second sound. A systolic bruit, rather rough in character, can be heard, without pressure, over the tumour in abdomen; a softer bruit can be heard over aorta and iliacs.

Special examination—Corrigan's flags show pulsation to be distensile laterally, but very doubtful vertically. Pulsation can be felt the same, no matter what position the patient is placed in. There is no bruit over spine. On auscultating along spine, whilst the patient sips water, it can be heard passing readily along the œsophagus into the stomach, and on placing the stethoscope over the tumour, in about thirty seconds the fluid is heard bubbling through on its way from the stomach to the intestines.

I ordered the patient to lie perfectly quiet, gave bismuth and morphia for vomiting and pain, and fluid diet.

In two days the pain was almost gone, she had only vomited once (nothing peculiar in vomit), says she feels well; pulsation, &c., as before. I ordered KI. gr. 15 three times daily in milk, rest as before, but increased the diet to eggs and fish in moderation. By the end of a week she felt so well that nothing would keep her from jumping up in bed and sometimes out of it, although she was warned that sudden death might supervene.

On October 12th (three weeks from admission) pulsation very indistinct, tumour small and much less distinct; bruit over tumour and aorta very much alike; weight, 7 st. 8 lbs. Patient insists on going home, and as she lives within twenty yards of the hospital, and says she will stay in bed and take her medicine, I discharged her on October 13th.

On the evening of the fourth day after her discharge she was brought in again to hospital at 5 p.m., and had evidently been dead about half an hour. Her husband stated that she felt so well in the morning that she got up and scrubbed the floor, then vomited, became weak, and died towards evening without assistance being sought.

I was unable to attend hospital for some days, so my colleague, Dr. Lumsden, very kindly obtained a hasty *post-mortem*, and secured the specimen for me. He has given me the following notes of what he found at the *post-mortem*:—On opening the abdomen the intestines seemed normal, stomach somewhat dilated, and on pushing up the pyloric end the tumour is found lying behind and below it. It is evidently an aneurysm of the cœliac axis. No signs of rupture, no increased anastomotic circulation above or below the tumour; vena cava not pressed on. He then opened the thorax, and took out the heart, aorta, and common iliacs *en masse*, together with the eleventh and twelfth dorsal and first lumbar vertebræ. All the other organs, including the brain, seemed normal.

As soon as I returned to hospital I examined the parts removed, and found as follows:—

Heart—On surface of right ventricle is a rectangular “white spot” 4 cms. long and 1 cm. broad; amount of fat on surface normal. Wall of left ventricle slightly hypertrophied; in right auricle and ventricle are large, tough clots.

Aorta—Valves normal, sinuses of Valsalva pouched and atheromatous; posterior one shows opening of coronary artery surrounded by atheroma. In its whole length the aorta shows more or less atheroma. From its commencement up to and including the origin of the left subclavian the aorta is dilated into fusiform aneurysm nearly double the calibre of the aorta. Immediately after giving off the left subclavian it is somewhat constricted and then dilated into a smaller fusiform aneurysm 4 cms. long. The cœliac axis is enlarged into a sacculated aneurysm about the size of a small hen egg. This aneurysm seems to spring from the cœliac axis, and involves the left side of the aorta down to the origin of the superior mesenteric artery, which seems to spring from the lower and anterior part of the aneurysm. The left renal artery arises 1 cm. below and the right 2 cms. below. The branches of the cœliac axis arise from the inferior part of the apex of the aneurysm to the left

side. Below the aneurysm the aorta is only half the calibre of that above.

The aorta above the aneurysm is firmly adherent to the eleventh dorsal vertebræ, and had to be torn to remove it. The portion of aorta involved in the aneurysm is firmly adherent to the lower part of eleventh and upper part of 12th dorsal vertebræ; and on separating it, it is found to be deficient behind, and the bodies of the vertebræ are eroded to a depth of 5 mm., the intervertebral disc being intact.

The Aneurysm—On incision the walls are found very fibrous, and vary in thickness from 3 mm. at the base to 7 mm. at the apex. The aneurysm is practically completely filled by firm laminated clot, adherent firmly above and to the right, but easily separated towards the left. The orifices of the branches of celiac axis seem occluded, but there is a tunnel through the clot which would allow blood into the superior mesenteric.

The case was most interesting, and it was practically impossible to give a definite diagnosis.

The diagnosis, to my mind, lay between (1) malignant tumour of pylorus or upper intestine; (2) gumma; (3) aneurysm of splenic artery or celiac axis. In favour of malignancy were age, sex, wasting, pain, vomiting, hæmorrhage, dilated stomach, gurgling felt and heard over tumour. In favour of gumma were history of dead-born children and rapid improvement on KI. In favour of aneurysm were probability of syphilis, pain, fixed pulsating tumour, bruit, the great variability of symptoms from day to day. Against this were sex, bleeding, wasting, vomiting, &c., and rapid improvement.

I considered that it was probably an aneurysm, and did not think it advisable to make certain by passing bougies, distending stomach with gas, or putting the patient under an anæsthetic.

I would wish to suggest an explanation for some of the symptoms—(1) Bleeding from the rectum, unless due to piles, may have been due to venous stasis of intestines

owing to obstruction of mesenteric artery; (2) vomiting most likely was due to rum and pressure on the stomach combined; (3) gurgling felt and heard was evidently due to pressure of the tumour pushing up the pyloric end of stomach; (4) death I consider was due to syncope, for although the clots were found in the right heart, yet the history of lying moribund for some time before death would account for them without supposing them to be emboli from the vena cava.

In conclusion, I must thank my colleague, Dr. Lumsden, for the great help he gave me in examining the case, and also our House Surgeon, Dr. Wentworth Taylor, for the trouble he took with regard to *post-mortem* and other notes.

NOTES ON A CASE OF SPONTANEOUS RUPTURE OF AORTA.

By J. LUMSDEN, M.D. (UNIV. DUBL.);

Physician to Mercer's Hospital.

[Read in the Section of Pathology, December 2, 1898.]

A YOUNG woman, aged twenty-three, from whom the specimen was taken, was brought dead into Mercer's Hospital in June, 1898. Very little information as to previous health was obtained, but it would appear she was in apparently good health, and was seen in the active discharge of her duties as a shop assistant a few minutes prior to death, and she was evidently in the act of lifting down a heavy box from a shelf when she suddenly dropped dead.

At the necropsy the body was found fairly well nourished. The pericardium was full of clots. A small linear rupture, which just admitted an ordinary cedar pencil, was discovered at the root of ascending aorta on its anterior aspect, immediately above the anterior sinus of Valsalva. There was a rent in the aortic tunics, commencing just above the junction of the right and left posterior aortic cusps, encircling the aorta parallel to the free margin of the valves, about $1\frac{1}{4}$ inches in length. Except at the point of rupture in front only the intima and media were apparently involved in the rupture, and, doubtless, had not the outer coat given way anteriorly a dissecting aneurysm might have resulted. Macroscopically there was no evidence of any extensive degeneration of the aortic walls, or of the heart, but a few small, opaque, yellowish-white, superficial and irregular patches in the endothelium and sub-endothelial tissue were

seen. They projected slightly above the surface, and could be rubbed off in places from the subjacent layers, which presented a normal appearance. There was no dilatation, and no narrowing or hypoplasia.

The condition is extremely rare, and it is very hard to understand how, in the absence of any evidence of advanced degenerative changes, rupture could have taken place.

Microscopically no definite pathological change was discovered. The middle coat of the aorta appeared to be normal, and, though the structure of the internal coat was not so distinct as it might be, yet there was no evidence of any thickening, cellular infiltration or degeneration. Spontaneous rupture of the heart or aorta is apparently an extremely rare accident, and few recorded cases exist. In the heart it has generally been found in the left ventricle or left auricle, nearly always in elderly people, and where well-marked evidence existed of a fatty granular or sclerotic degeneration.

Of spontaneous rupture of aorta I have only been able to find one case recorded, and that reported by Dr. Geo. A. Gibson, of Edinburgh, in his book recently published on "Diseases of Heart and Aorta." His case was in "a lad aged sixteen, who on admission to hospital presented a prematurely aged appearance, rigid pulse, dyspnoea, increased cardiac dulness and systolic murmurs heard over aortic, tricuspid and mitral areas; sixteen days after admission, while eating his dinner, he suddenly fell back, and died without a sound. At the autopsy the pericardium was found distended with blood which had escaped from a small linear opening towards the posterior part of ascending aorta, at the highest level of pericardium. The ventricles were considerably dilated, the mitral and tricuspid orifices enlarged, and the aorta atheromatous and dilated."

In my specimen, however, there is no evidence of any

marked degenerative change beyond the white superficial patches in the endothelial lining of aorta. It is, I think, extremely difficult to explain why rupture should have taken place, except on the supposition of some inherent weakness of the aortic walls.

ANEURYSM OF ASCENDING ARCH OF AORTA EXTENDING INTO LUNG.

By WILLIAM J. THOMPSON, M.D., M.R.C.P.;
Physician to Jervis-street Hospital.

[Read in the Section of Pathology, December 2, 1898.]

THE patient from whom this specimen was got was a well-nourished man, aged forty-five; occupation, a builder's labourer; was admitted to Jervis-street Hospital on November 13th, 1898. He was carried in by the police in a collapsed state, having had a severe attack of hæmoptysis while walking along the street. The upper part of the right lung, as far down as the 5th rib in the nipple line, was dull on percussion, no tumour or pulsation, but a slight thrill could be felt on palpation. The veins on right side of thorax were prominent and distended; there was no swelling of arm or neck, and total absence of pain. The radial pulse on right side was much weaker than on left, and occasionally the patient completely lost his voice. There was no difficulty in diagnosing aneurysm of ascending arch, extending into right lung, and the case looked hopeless. The patient died suddenly after being three days in hospital. The specimen shows a sacculated aneurysm, embracing the upper half of ascending arch, lying more posteriorly and laterally than anteriorly, behind superior vena cava. It extended in an upward and outward direction for about two inches, its width being about the same as its length. The sac seemed at its commencement to be made up of pericardium and pleura, but at its apex it was made up of semi-consolidated lung tissue.

The whole length of the aorta was studded with atheromatous patches, varying in size from that of a sixpence to that of a two shilling piece. Evidently the aneurysm had its origin in one of these patches, and had suddenly burst into lung tissue. The two upper lobes of the right lung were consolidated.

ANEURYSM OF DESCENDING ARCH OF THE AORTA PERFORATING ŒSOPHAGUS.

By WILLIAM J. THOMPSON, M.D., M.R.C.P.;
Physician to Jervis-street, Hospital.

[Read in the Section of Pathology, December 2, 1898.]

THE subject of this aneurysm was also a builder's labourer, aged forty-seven, and presented no appearance of wasting. When brought to Jervis-street Hospital on the 2nd November, 1898, it was found that life was extinct, and blood was still oozing from the mouth and nostrils. The history given was that when going to lift some weight he suddenly collapsed, and that when he had fallen blood came from his mouth. He had never complained of pain about the back or thorax; never had any difficulty in swallowing; was always strong and healthy; had not missed one day's work for years. At the *post-mortem* the stomach and intestines as far as the ileo-cæcal valve were found full of blood. Corresponding to the level of the seventh dorsal vertebræ there was a ragged opening in the œsophagus about the size of a sixpence, placed rather posteriorly, laterally, and to the left. This communicated with an aneurysmal sac which sprang from the aorta anteriorly, laterally, and towards the right. The opening between the aorta and sac had a diameter of about three-quarters of an inch. The sac itself was small, had thin walls, which seemed to be made of the outer covering of the aorta. There was only one small atheromatous patch situated in the transverse portion of aorta.

DR. SCOTT said that the suggested influence of syphilis in aneurysms was a point of interest. The rupture of aorta in Dr. Lumsden's case was to him extraordinarily mysterious.

DR. KNOTT asked Dr. Thompson the cause of death in the case of aneurysm which perforated the œsophagus. Aneurysms opening into serous cavities always burst suddenly, but quite the opposite into mucous canals, where the hæmorrhage is gradual. He thought that dysphagia in aneurysm was never very prominent, and was always incomplete.

DR. E. J. McWEENEY said that in Dr. Lumsden's case of rupture of arch of aorta it would be advisable to have a microscopic examination of the coats of the vessel in the neighbourhood of the rupture, because there could not be an effect without a cause.

DR. LUMSDEN, in reply, agreed with Dr. McWeeney that the case was an extreme puzzle, and was, of course, quite incomplete without a section; but he wished to show the specimen before being cut up. He would be glad to make known the result of the microscopic examination.

DR. THOMPSON, in reply to Dr. Knott, said that *post-mortem* examination showed the stomach to be full of blood, which penetrated even to the ileo-cæcal valve. There were no symptoms of dysphagia in this case, although the aneurysm must have pressed on the œsophagus.

A NOTE ON THE AGGLUTINABILITY OF DIFFERENT "STRAINS" OF THE TYPHOID BACILLUS.

By E. J. McWEENEY, M.A., M.D. (R.U.I.), L.R.C.P.I. ;

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School, &c.

[Read in the Section of Pathology, January 13, 1899.]

IN September last I had occasion to perform an autopsy on the body of a girl, aged twenty, who died in the Mater Misericordiæ Hospital after an attack of typhoid. The attack had been one of moderate severity, and after deferescence the patient's condition remained very feeble. Cardiac weakness became more and more pronounced, until on the ninth day of apyrexia she died. The chief *post-mortem* appearances were—A few slate-grey patches, about the size of a shilling piece, scattered here and there on Peyer's patches in the lower part of the ileum; numerous follicular ulcers in the colon; spleen enlarged, very soft; mesenteric glands slightly enlarged; heart pale, flabby, fatty-degenerate; some few ounces of fluid in each pleura; hypostatic pneumonia of both bases, and œdema of the rest of the pulmonary tissue.

The patient's serum had been tested on admission, and found to give a typical agglutination with the typhoid bacillus.

The gall-bladder was found full of bile, and some of this was aspirated into a sterile bulbous capillary, and diluted by allowing one drop to fall from the capillary into 10 cc. of sterile broth. From this dilute bile an agar-stroke was made and set aside in the incubator. Next day the sloping agar-surface presented an abundance of typical typhoid-like



FIG. 1 ($\times 1,000$).—Typhoid "A" (Pitfield's stain).

FIG. 2 ($\times 1,000$).—Typhoid "L, S." (Pitfield's stain).

colonies A shake in sugar-agar having developed without gas evolution, the organism was regarded as genuine Eberth's bacillus, and at once applied to sero-diagnostic purposes. The culture I had been using, having survived the long vacation, was not in good condition, and I had for some time been desirous of replacing it with a fresher strain. The numerous other races which I possessed of the typhoid bacillus had, through a misinterpretation of my orders on the part of the porter, been all destroyed during the vacation, and accordingly I found myself compelled to at once resort to this new race—which I will call "T. A." for the ordinary hospital diagnostic work.

It is not now my intention to go into the details of the cases in which this culture was used; suffice it to say that the result was unsatisfactory. Cases which subsequently ran a typical typhoid course failed to clump young cultures of this bacillus. A further element of difficulty was that the active motility which the organisms certainly manifested in the early hours of their growth at incubation temperature on a fresh substratum, soon died down (at the end of 24 hours) to a sluggish, waggling movement, exactly resembling that of young cultures of *B. coli*. Any immobilisation which occurred on contact with serum could not, therefore, be attributed with certainty to the effect of the latter, and was thus deprived of its diagnostic value. Cultures placed in contact with sera from typhoid cases selected as being typical underwent very imperfect and slow clumping. The results were so difficult of interpretation that I found myself obliged to temporarily discontinue sero-diagnostic work at the hospital pending the arrival of a fresh and reliable strain of typhoid, for which I am indebted to my colleague Prof. Lorrain Smith, of Queen's College, Belfast.

The first thought that would naturally occur to one as

an explanation of the failure of these bacilli to clump is, of course, that they were not genuine typhoid but *B. coli*, which, as is well known, is very often present in the bile—indeed in all the organs—of bodies that have been dead some time. The presence of follicular ulcers in the colon would, of course, render the escape of organisms from the bowel all the easier. In order to test this, I made a parallel series of cultures of T. A. and the newly arrived Bacillus (which I shall call “T. L. S.”) on a number of different substrata (strokes on ordinary agar and gelatine, shake in glucose agar, broth, milk, potato), with results practically indistinguishable. Neither coagulated milk, neither produced gas in the depth, neither formed a visible scum on potato—though T. A. certainly did in old potato-culture make a slightly brownish-yellow streak, which was just perceptible.

The following were the differences found:—

(a.) *Morphological*.—L. S. much larger, averaging nearly twice as long and half as thick again as T. A.; motility greater even at first and persisting longer; cilia more numerous, longer (see Fig. 1) and thicker than those of T. A., and much more readily stainable (Pitfield's method). As many as 12 to 20 cilia were easily demonstrable on individuals of T. L. S., but 6 to 12 were all that could be found on T. A. (see Fig. 2).

(b.) *Cultural*.—1. On *gelatine plates* L. S. grew much more rapidly than T. A., the growth of which at 20° C. was excessively slow, taking 3 weeks before the superficial colonies reached the size attained by those of L. S. in 4 days—viz., 2 mm. Superficial colonies of L. S. showed, on examination with a low power, the well-known reticulating system of cracks, whereas such were not to be seen at all in those of T. A., or were to be detected only with great difficulty. 2. In *broth*—After two days in the warm incu-

bator, L. S., like most typhoid strains, had begun to subside, leaving the top layer of the fluid clear; T. A., on the other hand, remained turbid throughout for at least eight days. At the end of that time the addition of 1-250th part of its bulk of typhoid serum failed to cause precipitation, although cultures of L. S. were readily precipitated by a drop of the same serum.

The agglutinability of these two strains was now tested on various sera. The dilutions used were 1 in 10, 1 in 100, 1 in 500 and 1 in 1,000. The diluting fluid was broth-culture of the bacillus to be tested. The dilution was effected in watch-glasses, from which large drops were removed to the slide, a cover-glass applied and the preparations placed in a moist chamber. Observation was prolonged over a period of from two to five hours.

Here are some of the results:—

Serum 6.—Clumps L. S. in dil. 1 in 10, not higher; immobilisation incomplete. *On T. A. no effect whatever.*

Serum 7.—L. S. is clumped in dils. 1 in 10 and 1 in 100, not in 1 in 500. T. A. clumped in dil. 1 in 10, *not higher.*

Serum 8.—Here clumping took place in all three dils. with both strains; but it was observed that in all three the number of bacilli left free was much greater in the case of T. A. than in that of L. S. Further, in the dil. 1 in 500, L. S. still gave large clumps, whilst T. A. yielded small clumps only, and the bacilli are described in my note-book as precipitated rather than agglutinated.

Serum 9.—Another active one, gave even better marked results. I transcribe the following from the laboratory note-book:—

“Time 5 hours; temperature 22° C.

“Dil. 1 in 10.

“L. S.—Clumps enormous, all the bacilli and many red corps. entangled in them; no organisms free.

"T. A.—Many very solid opaque clumps; *a few bacilli free.*

"Dil. 1 in 550.

"L. S.—Clumps numerous, small; not very well-defined for the most part, but some very distinct (low power); field not cleared.

"T. A.—Practically no true clumping; some very minute agglomerations, but fluid evenly turbid."

Serum 10.—That of another undoubted case of typhoid, gave similar results.

It is hardly necessary to cite further cases. It may be taken as established that the race "T. A.," whilst presenting the leading characters of the typhoid bacillus, differed from that organism in certain minor respects, both cultural and morphological, as well as in the extremely important one, from the practical standpoint, that it gave different sero-diagnostic results from an authentic race of *B. typh. abd.*, and that these results were invariably in the negative direction.

After the numerous transfers at short intervals to which T. A. was subjected during the somewhat close study which it underwent at my hands, its motility sensibly increased, as did also its sensitiveness to typhoid serum, so that when, some time afterwards, I sent it to Dr. Durham, of Cambridge, who very kindly compared it for me with others of his large stock of organisms of the typhoid group, he could not find much difference in point of either motility, agglutinability, or virulence between T. A. and the other races which he compared with it.

(Since the above was written, I have found in Cabot's recently published work on "The Serum Diagnosis of Disease"—an admirable book of reference—a record of an experience precisely similar to my own. Cabot says—"I remember a culture obtained from the spleen of the dead

fœtus of a woman who had miscarried during an attack of typhoid. These organisms fulfilled all the tests for the identification of Eberth's bacilli, save that their motility was very slight. After a few transplantations in the thermostat on agar-agar, these bacilli grew nearly as motile as those generally seen. *Their response to the action of a given typhoid serum increased parallel to their increase of motility.* Probably the conditions of nutrition in the spleen of the fœtus were sufficiently unfavourable to deprive the bacilli for the time of their naturally active locomotive power, which was easily restored by a proper diet. . . . I have seen similar behaviour in a race of bacilli cultivated from a single colony, which was the only result of a culture from the spleen of a typhoid patient who died of perforation *in the fifth week of the disease. Most of the ulcers were wholly healed and the spleen was not enlarged.*")

Let us now endeavour, in the light of recent research-work, to ascertain the cause of this want of agglutinability.

It is now known that the process of agglutination is one in which the bacilli play a purely passive role. Dead bacilli—killed by heat or with formol—are clumped nearly as easily as fresh living cultures by a powerful serum. Furthermore, as was first worked out by Kraus, and then more fully by Nicolle, agglutination can be obtained without any bacilli at all. If a culture of *B. coli* be macerated so that the contents of the bacterial cell pass into the liquid, and this is then filtered, the addition to the limpid filtrate of a fractional amount of the serum of an animal that has been rendered highly immune to the same bacillus will bring about the formation of flocculent granules precisely similar to bacterial agglomerations. The two liquids, each of which was previously quite limpid, produce, a few hours after admixture, masses of amorphous flocculent matter closely resembling clumps of agglutinated bacilli. Furthermore,

if to the filtered culture of *B. coli* we add a loopful of some other organism (proteus or cholera), and then add a drop of the *coli immune* serum, the extraneous organism (proteus, cholera) will, in a few hours, be found completely clumped—whether living or dead makes no difference. Finally the extraneous bacilli in the last-mentioned experiment may be replaced by any sort of fine inpalpable powder—talc, for instance. The talc granules run together in masses large enough to be visible to the naked eye, whilst the fluid in which they were suspended becomes quite clear. The most probable interpretation of these observations is that agglutination is a phenomenon comparable to coagulation. A coagulable (agglutinable) substance is contained in the bacterial bodies, whence it diffuses out into the culture-fluid. The immune serume contains a coagulating ferment (agglutinin). The inter-action of these two substances brings about a modification in the molecular attractions prevailing in the liquid.

In the light of these observations it would therefore seem as though the race which I have called T. A. differ from ordinary typhoid races in the fact that it produces, or at any rate allows to diffuse, a smaller amount of agglutinable substance. Whether this is due to its having existed some time in the human body subject to the action of highly immunised humours or otherwise unfavourable circumstances, as suggested by Cabot, or to some other cause, must, for the present, be left undecided.

[For these micro-photograms I am greatly indebted to A. Pringle, Esq., F.R.M.S.—*E. J. McW.*]

EXPLANATION OF FIGURES.

- Fig. 1.—Normal typhoid bacilli (T. L. S.), from agar-culture 16 hours old at 37° C. Cilia stained by Pitfield's method, and photographed under a magnification of 1,000 diameters.
- Fig. 2.—The abnormal race of typhoid bacilli (T. A.), from agar-culture of same age as in Fig 1. Cilia fewer, shorter and finer. Stained in precisely the same way as Fig. 1+1,000.

MR. O'SULLIVAN said that in a case of Dr. Finny's, in Dun's Hospital, of typhoid fever, accompanied by effusion into the knee joint, he had isolated bacilli from the effusion which gave the culture reactions, as then practised, of typhoid bacilli, and showed stronger agglutination with the serum of typhoid patients than the stock bacilli which he had at the time. He thought then that this might be due to the fact that the bacilli were more virulent, but it appeared that virulence and the faculty of being agglutinated had no relation to one another. He would like to ask Dr. McWeeney whether, in Kraus's experiment, the behaviour of the talc had been examined under the microscope and proved to be a true agglutination, and what was known as to the nature of the coagulation of which he had spoken?

DR. E. J. McWEENEY, replying, said the phenomenon which occurred was one of agglutination and not precipitation. The matter stood exactly thus—one had a limpid fluid consisting of a sort of extract of an old virulent cultivation of, say, typhoid bacillus. Suppose this divided into two parts. To both of these parts is added some talc, and on stirring it up a turbid mixture is produced full of the minute particles of talc. If, now, to one of these tubes a drop of highly immune serum be added, and to the other a drop of non-immune serum, or of serum immunised against some other bacillus, there will be the following differences in appearances:—In that to which the homologous serum has been added there is not merely a precipitation of the talc, but an absolute agglutination of it; the minute particles will run together, forming masses of considerable size, which sink to the bottom. On the other hand, no change whatever occurs in the other tube. It was difficult to account for this upon any purely physical hypothesis, as apart from a sort of chemico-vital action of the same general nature as coagulation by ferments.

PNEUMOCOCCAL SEPTICÆMIA WITH ULCE-
RATIVE ENDOCARDITIS CONSECUTIVE TO
CROUPOUS PNEUMONIA. PNEUMOCOCCI
DEMONSTRATED IN THE BLOOD DURING
LIFE.

By E. J. McWEENEY, M.A., M.D. (R.U.I.), L.R.C.P.I.;
Professor of Pathology and Bacteriology, Catholic University Medical
School, &c.

[Read in the Section of Pathology, February 24, 1899.]

THE patient, a man aged thirty-seven, was admitted on the 5th of December, 1898, to the Mater Hospital, under the care of Dr. Murphy, with right apical pneumonia. Crisis occurred on the ninth day, and was attended with a good deal of collapse. Ten days afterwards patient was allowed up one evening and grew so faint that he had to be assisted back to bed. On January 1st an aortic systolic murmur developed, which became very loud; prostration became more marked, delirium ensued, the temperature curve assumed a pyæmic type, and death ensued on the 5th of January. On the 2nd blood was taken, with strict precautions, from the finger, and inoculated by means of a pipette on several tubes of oblique glycerine agar. After twenty-four hours incubation at 37°, one of these tubes presented a few extremely minute dewdrop-like colonies, which proved to consist of Frankel's pneumococcus. The other tubes remained sterile, as far as could be seen with the naked eye. At the autopsy (forty-eight hours after death) blood was aspirated from the right auricle into a sterile bulbed pipette, and inoculated on agar tubes. Owing to the solid coagulation of the blood but little liquid could be obtained. The incubated tubes showed numerous large

circular colonies, like discs of porcelain (probably the *Bacillus coli*) but also very many minute translucent, whitish, very delicately fringed colonies, which proved to be the pneumococcus. A broth culture from one of them, after twenty-four hours at 37°, was scarcely turbid, yet 1 cc. injected intraperitoneally into a rabbit caused death in seventeen hours. Pneumococci with typical capsules were in the blood of every organ of this rabbit examined. The other *post mortem* results were, briefly: pericardium universally obliterated by recent adhesions, parietal layer being readily stripped off; myocardium of auricles soft and friable like wet blotting paper. Right posterior cusp of aortic valve presented a mass of vegetations as big as a cherry—colour, greyish green where not covered with clot; behind this the cusp perforated; hole would admit an ordinary pen handle. Grey hepatisation of most of the right lung. Spleen twice the natural size, infarcted throughout. Embolus in primary branch of splenic artery—fibrinous, crammed with pneumococci.

AN ACUTE CASE OF HODGKIN'S DISEASE.

By JAMES B. COLEMAN, M.D., F.R.C.P.;

Physician to the Richmond, Whitworth, and Hardwicke Hospitals, and to the National Hospital for Consumption for Ireland.

[Read in the Section of Pathology, February 24, 1899.]

THE case of Hodgkin's disease which I bring before the Academy this evening is remarkable for its rapid clinical course as well as for the widespread distribution of the enlarged glands and adenoid growths.

CASE.—The patient, a labourer, fifty years of age, was admitted to the Whitworth Hospital last December, complaining of difficulty in moving his left arm, owing to a swelling in the corresponding axilla. About two months previously he had noticed an enlargement in the left side of his neck. This gradually increased in size, but caused him no inconvenience. About a month ago he was conscious of a swelling in his left axilla, and soon afterwards in his left groin. He had always been a healthy man, and he gave no history of syphilis or intemperance. On admission he was somewhat emaciated; he did not look anæmic; his skin was dry and scurfy, and his temperature normal; his heart and lungs showed no signs of disease; the superficial glands all over his body were enlarged, the enlargement being most marked in his left axilla and groin and in the left side of his neck. Dulness beneath the sternum, and extending thence laterally, pointed to the presence of enlarged glands in his thorax; the spleen and liver were palpable. Examination of the blood disclosed nothing abnormal except a slight increase of the white cells—

Hæmoglobin	-	100 per cent.
Red cells	-	5,000,000 per cubic mm.
White cells	-	11,200 " " "

Lymphocytes constituted 40 per cent. of the white cells.

Stained cover-glass preparations of his blood showed an absence of micro-organisms, and cultural experiments gave an equally negative result. His urine was normal. His appetite was good, and he did not feel sick. After a week his appetite began to fail, and

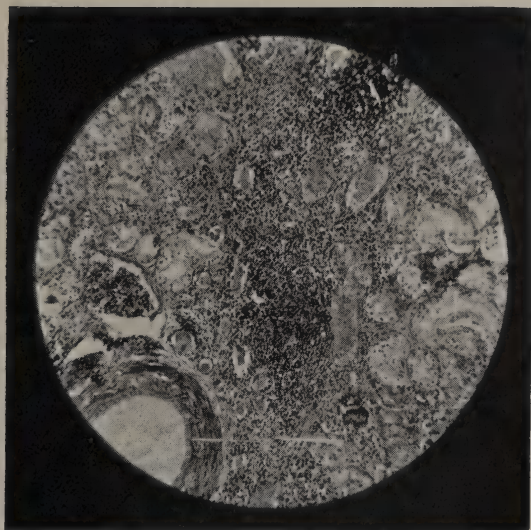


FIG. 1 ($\times 80$).—Patchy infiltration of kidney with ordinary “lymphoid cells.”

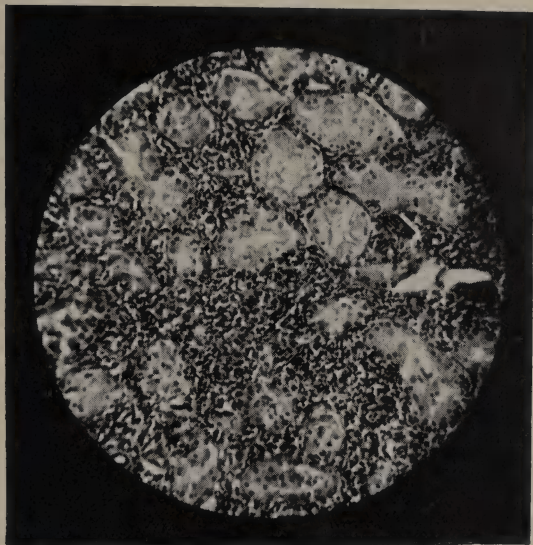


FIG. 2 ($\times 250$).—Mode of infiltration of kidney with neoplastic cells.

he became irritable; then day after day he became more and more prostrate and drowsy, whilst he was delirious at times. A few days before his death his temperature ran up to 100° and 101° . His death occurred about eleven weeks from the onset of the disease.

At the necropsy there was universal enlargement of the superficial lymphatic glands, as well as of the mediastinal, retro-peritoneal, and mesenteric glands. Adenoid nodules were found in both kidneys, in the small intestine, spleen, and liver. The spleen weighed 19 ozs., and the liver was also enlarged, and growing in from its capsule were many large masses of adenoid material. Below the liver a large mass of glands surrounded the aorta and involved the supra-renal bodies.

The nature of Hodgkin's disease is obscure. Clinically it can be distinguished from lymphatic leucocythæmia only by the examination of the blood; and it is interesting to note that reliable observers have recorded cases of the disease which were transformed into leucocythæmia. Indeed, Cohnheim called Hodgkin's disease an *aleukæmic vorstadium* of leucocythæmia. Much evidence can be adduced in support of the view that Hodgkin's disease is of an infective nature—micro-organisms have been demonstrated by numerous observers. One case at least of direct infection has been recorded by Obratzow; its resemblance to other infective processes, and its clinical features—enlarged glands, fever, hæmorrhages, anæmia, and its fatal termination—may be taken as evidence in the same direction.

In the case of my patient no micro-organisms could be detected in his blood or in the new growths.

In conclusion, I am indebted to my friend, Dr. McWeeney, for the following very complete investigation into the pathology and bacteriology of the case:—

“The clinical aspect of this remarkable case has been dealt with by Dr. Coleman. Through his kindness I had an opportunity of examining the specimens in an excellent state of preservation.

"I.—BACTERIOLOGICAL EXAMINATION.

"Pieces from the centre of one of the largest of the lymphoid nodules (which had been laid open with a hot knife) were torn out with sterile forceps, and smeared over the surface of a considerable number of tubes of ordinary agar, glycerine agar, ordinary serum (ox), Löffler's serum, and glycerine serum; other pieces were added to sterile broth. All the tubes were incubated at 37° C., and carefully watched from day to day. No development took place on any of them. Microscopic examination of the tissues after careful fixation, sectioning, and staining, failed to reveal any undoubted organisms. Granules that held the violet stain somewhat obstinately by Gram's method were, it is true, seen; but I do not think that they were organisms, but, rather, some product of cellular breakdown. They will be described later on.

"About three grammes of the material were pulped in a mortar with a few cc. of sterile broth, and injected into the peritoneal cavity of a rabbit. No morbid symptom followed; there was no loss of weight, and when, a month later, the animal was killed the cellular material had disappeared.

"II.—MORBID HISTOLOGY.

"A. *Methods*.—The pieces cut from the margins of the neoplastic nodules were fixed with formaline (10 per cent.), passed through graded alcohols, and imbedded in celloidin, with the object of obtaining as large sections as possible. Staining was done with Ehrlich's hæmatoxylin, followed by a mixture of acid fuchsin and picric acid (Van Gieson's method). For the demonstration of organisms the Weigert-Gram method, in combination with carbol-glycerine-fuchsin (Czaplewski's modification), was employed.

"B. *Results*—1. *Liver*.—Nowhere was the organ quite normal. The intra-lobular capillaries were everywhere dilated, and the intervening liver-cells often atrophic, sometimes absent over entire low-power fields, so as to give the idea of an angiomatous change. The portal canals contained an excess of connective tissue, with here and there—far away from the nodule—groups of cells unmistakably identical with those composing the new growth. Towards the margin of the nodule these cells became somewhat more numerous. At the margin of the nodule all the hepatic structure, portal connective tissue as well as liver cells, seemed to melt away before the advancing swarm of neoplastic cells. Some way into

the nodule strands of compressed and atrophic liver cells could still be traced and recognised by the bile pigment they still contained; but further from the margin they, too, ceased, and only the neoplasm remained. I failed to observe any evidence of compression of the liver cells by a development of lymphoid cells within the portal canals. The hepatic tissue was destroyed, and its place occupied by an advancing swarm of new cells, exactly as in the case of a malignant new growth.

"2. *Kidney*.—Here the appearances were very like those just described. There was a certain amount of interstitial nephritis, with some thickening of the coats of the smaller arteries and occasional patches of infiltration with 'lymphoid' cells, which were quiet unlike the neoplastic cells soon to be described. Towards the margin of the nodules there began to appear, between the tubules, individual cells and groups of cells similar to those of which the nodules were composed. These new elements rapidly increased in number so as to separate the renal structures and convert them into islands, as it were, in the sea of the advancing neoplasm. Towards the centre of the nodule they gradually disappeared as though they had undergone solution. Before their disappearance they came to contain groups of granules, similar in size and appearance to those seen in renal or hepatic epithelium, that is in a state of fatty degeneration. These granules did not, however, consist of fat, but of some other substance, for they held the Gram. Here and there also in the epithelium larger granules, not unlike groups of minute yeast-cells, were seen in the dying protoplasm. These took the Gram imperfectly.

"*The medium size and small arteries of both liver and kidney, and the glomeruli and basement membrane of the tubules of the latter organ, were the seat of pronounced amyloid change and gave the typical colour reactions.*

"3. *Lymphatics*.—The enlarged lymphatic glands presented an appearance precisely similar to that of the neoplasms in liver and kidneys now to be described. They were sprinkled all over with mitoses, and presented numerous hyaline patches; but their structure was, in my opinion at least, clearly distinguishable from normal adenoid tissue.

"4. *The Neoplastic Nodules* consisted of small, polymorphous cells, with nuclei measuring from 4μ to 7μ across. Some of these took the stain deeply, so as to be almost black. Others of the nuclei were 'vesicular,' and contained numerous nucleoli. Others,

again—and this feature I am inclined to regard as very important—showed a distinct tendency to become elongated, sometimes assuming a spindle shape, sometimes thickened at the poles and linear in the middle, like those of connective tissue cells when developing under unfavourable circumstances—*e.g.*, in the periphery of a tuberculous focus. Many of the nuclei were undergoing division; but the chromosomes were, for the most part, ‘clumped,’ and few really typical nuclear figures were obtainable (Gram’s method).

“Various stages of karyolysis were observed, and a few enormous budding nuclei, similar to those figured by Fabre-Domergue in his well-known work, ‘*Les Cancers Epithéliaux*’ (Paris: Carre, 1898), were also noticed.

“The protoplasm was usually small in amount, hugging the nucleus pretty closely, and, in the case of the lymphoid elements, hardly visible around it. The great budding nuclei above mentioned were imbedded within relatively large masses of protoplasm; true giant-cells were absent. A few of the neoplastic cells contained eosinophil granules. The absence of *mast-cells* was particularly noticeable.

“Of stroma there was hardly a trace. The new cells seemed, so far as could be made out, to lie in immediate contact with each other, and the very few vessels that could be distinguished were supported by a very little connective tissue.

“*Mode of Invasion.*—In the *liver* this appeared to be by the increase in size of spherical nodules of the new growth exactly as in cancer. Whether these nodules owned an embolic origin, or started from the groups of similar cells already noted as occurring in the portal canals far from any nodule, I am unable to say.

“In the *kidney* the neoplasm entered the organ at the hilus and accompanied the branches of the renal artery—the adventitia of which was, in fact, in direct contact with the masses of new cells.

“*Lymphatics.*—Here it would be impossible to speak of any mode of *invasion*. The universal distribution of the mitoses and the unbroken chain of transitional forms between normal lymphoid and neoplastic cells seem to point unmistakably to the lymphatic glands as the seat of origin of the new formation. It would seem as though it had originated independently in the several adenoid structures, as if in response to some common stimulus.

“In the parenchymatous viscera (liver and kidneys) its histological and distributional characters seem to me identical with those of small round-cell sarcoma.

“A discussion of the voluminous literature of the subject would take me far beyond the limits of this communication, which is intended merely as a careful description of a case observed under favourable circumstances.”

DR. E. J. McWEENEY asked Dr. Coleman if there was any history of suppuration, syphilis, or tuberculosis to account for the lardaceous disease? In the absence of these, the lardaceous change must be considered part and parcel of the morbid appearances. One of the cardinal symptoms of Hodgkin's disease was absent in this case—viz., *oligocythæmia rubra*.

BRIGADE SURGEON-LIEUT.-COL. BURKE said when at Gibraltar and Malta he had seen many specimens of amyloid degeneration, and the liver specimens now exhibited were very like those he had seen due to syphilitic disease.

DR. COLEMAN, in reply, said that there was no history of syphilis or long-continued suppuration. He said that anæmia is not necessarily a part of Hodgkin's disease, and only becomes marked as the case progresses. Anæmia has been noted as absent in undoubted true cases of the disease, especially in the early stages. The synonyms of this disease were numberless. The current issue of The New Sydenham Society's Atlas of Pathology^a contains four plates, copied from drawings made by Sir Robert Carswell, illustrating a case of Hodgkin's malady. The specimens which are exhibited to-night bear a remarkable resemblance to those figured in the plates in question.

^a Fasciculus XII.

SARCOMA OF THE SUPRARENALS AND SECONDARILY OF THE LUNG.

BY J. MAGEE FINNY, M.D., DUBL.;
Past President, Royal College of Physicians, Ireland;
Physician to Sir Patrick Dun's Hospital.

[Read in the Section of Pathology, February 24, 1899.]

THE specimens I exhibit are the left lung and the suprarenals, which are the seat of sarcoma, and, by the kindness of Dr. O'Sullivan, Lecturer in Pathology, Trinity College, Dublin, there are under the microscopes several sections of the diseased organs.

The patient from whom these specimens were obtained was admitted to Sir Patrick Dun's Hospital on 13th October, 1898, and died 20th November, 1898.

The following notes of the case were compiled from those taken by Mr. Gibbon Fitzgibbon, my clinical clerk, to whom I am indebted for his careful and accurate daily records:—

The patient was sixty-six years of age, a labourer in the gas works, and complained of cough, copious expectoration and debility. He looked very haggard and emaciated, and his complexion was notably darker than that of any other patient in the ward, or what we are accustomed to see in those labourers exposed to the heat and vapours at the gas works, who apply for medical aid at the hospital.

The arteries on his forehead, and the radials, were tortuous and atheromatous. The ascending aorta was dilated, and caused an area of dulness and pulsation in the second and third right intercostal spaces near the sternum. A double murmur was audible in this area, but as it was limited to it, and the pulse was not collapsing, it was considered to be due to an atheromatous dilated vessel rather than obstructive and regurgitant disease of the aortic valves; the cardiac area of dulness was not discernible owing to

the emphysematous condition of the border of the left lung, and the cardiac impulse was indistinctly defined in its normal position. There was no dextrocardia.

Examination of the lungs showed the right to be normal, except for emphysema; but the left side was dull on percussion over the lower lobe behind from the fourth rib down, and this dullness did not pass further forward than the mid-axillary line. The dullness did not change on change of posture, and over this area there was an absence of respiratory and vocal sounds, and of vocal fremitus. The upper part of the thorax on the left side in front gave a modified skodaic resonance. It was plain therefore that we had to deal with a case of encysted pleurisy. One or two unusual features were noted—(1) that the decubitus of the patient was on or towards the right or healthy side; and (2), that an area of acute sensitiveness and tenderness to pressure existed over the fourth and fifth ribs and intercostal spaces near the nipple.

On November 4th the pleura was explored in the scapular line at the ninth interspace and a syringeful of bright red fluid was withdrawn, which on examination was found to be blood-stained serum, with some leucocytes in it, but these were healthy.

On November 7th a trochar and canula was inserted twice, but no fluid was withdrawn, although with an exploring needle and hypodermic syringe half an ounce of fluid was withdrawn similar to that of the 4th.

As there was no special urgency to tap, and as the nature of the fluid and the constitutional cachexia made me consider it a case of cancer of the pleura, no further attempt to withdraw the fluid was made then or subsequently, and there were no changes noticed in the physical signs, except that, a few days later, a distinct friction sound was audible under the pectoral fold in front of the mid-axillary dullness already referred to. The urine was examined on several occasions and found free from albumin. During the last week of his life he suffered from sleeplessness, progressive weakness, and nocturnal sweatings. The sputum was examined for tubercle bacilli on two occasions, but with a negative result.

The pulse was usually between 104 and 120. The respi-

ration was not increased, and the temperature generally every second day rose to 101° – 101.6° , and fell to subnormal or normal on the intermediate day.

The patient died of asthenia on 20th November, 1898.

The *post-mortem* was made by Dr. Littledale, our then House Surgeon, and the contents of the thorax, the diaphragm, and the kidneys were removed *en masse*, and revealed a very interesting pathological study:—

The heart was greatly hypertrophied, without much dilatation of the cavities; the mitral valve was healthy; the aortic valves were thickened, but not ulcerated, and capable of meeting and closing the opening; the coronaries were calcified, and the aorta presented an excellent example of calcareous plates and rugosities, with very great and general dilatation, producing, in fact, a *cylindroid* aneurysm.

The left pleura costalis was enormously thickened, and contained a quantity of blood, which was encysted to the posterior half of that side. The lower lobe of left lung was a mass of soft, grumous, bloody detritus, which when scooped out left a ragged cavity, without any limiting membrane, and showed a sarcoma infiltrating to more or less depth the rest of the middle part of the lobe.

Below the diaphragm, but unattached to it, the seat of the left adrenal was occupied by a tumour the size of a foetal head, and which lay above and upon the left renal arteries and veins, and pressed into the left kidney. It was a mass of sarcoma rapidly breaking down, and full of blood. When emptied of its contents the sac was distinct from the kidney, while into its infiltrated walls a small probe could be passed from left renal vein. A similar condition, but to a much smaller extent—not larger than a pullet egg—was found in the right suprarenal body.

Thus the case was one in which the left bloody pleurisy played but a small part, except so far as supplying the only physical feature recognisable during life, while there were these distinct foci of sarcomatous disease—viz., the left suprarenal, the right suprarenal, and the centre of the lower lobe of the left lung.

From the rarity of sarcoma being a primary disease of

the lungs, and the frequency of the suprarenals being the first part affected by this pathological neoplasm, it was not improbable, as Dr. O'Sullivan suggested, that the disease originated in the connective tissue or vessels of the left adrenal, that by the open vein it passed through the left renal vein into the circulation, and directly affected the right adrenal, and that by embolic infarction it found its final resting-place in the substance of the left lung. The most careful examination failed to show any extension from the adrenals to or through the diaphragm.

Dr. O'Sullivan has kindly made numerous and various microscopical sections of the left kidney and of the lung. These showed sarcoma of a mixed character, and, what was most remarkable and strange, a number of giant polynuclear or myeloid cells, containing as many as twelve or fourteen nuclei, and resembling exactly those found in sarcoma springing from the periosteum or ends of bone. The case presented therefore the rare peculiarity—not unknown in the life-history of sarcoma—of reproducing cells of connective tissue type, which was not that of the matrix from which it grew, inasmuch as there was in it a complete absence of any bone disease.

ENTERIC FEVER FATAL THROUGH EMBOLIC HEMIPLEGIA.

By J. W. MOORE, M.D., DUBL., P.R.C.P.I.;

Senior Physician to the Meath Hospital ;

Professor of Practice of Medicine, Royal College of Surgeons in Ireland.

[Read in the Section of Pathology, March 24, 1899.]

ACCORDING to Murchison, paralysis is an occasional sequel of enteric fever. It may not supervene till many weeks after the commencement of convalescence, and it is usually temporary, recovery taking place within a few weeks or months.

A full account of the nervous lesions in this fever will be found in a monograph by H. Nothnagel on “Die nervösen Nachkrankheiten des Abdominal-typhus,” published in the *Deutsches Archiv für klinisches Medicin*, 1872 (Vol. IX., page 480). He states that paraplegia is the most common form of paralysis after enteric fever, but it may also take the form of hemiplegia. Dr. Charles West, in his “Lectures on Diseases of Infancy and Childhood” (6th edition, 1874, page 776), mentions the case of a child who had convulsions followed by hemiplegia, and recovered. Several cases of temporary aphasia after enteric fever in children have been recorded by Weisse and Friedrich (*Gazette hebdomadaire*, 1865, No. 140, page 591).

In the third edition of Murchison’s classical work on the Continued Fevers, the editor, Dr. W. Cayley, observes that sudden hemiplegia, probably due to embolism, sometimes occurs during enteric fever. Dr. Cayley recalls the fact that he reported, in the *Medical Times and Gazette* for March 23, 1878, a case of right hemiplegia and aphasia as a sequel of this fever. The patient was a boy, aged eleven

years, who was admitted into the North-Eastern Hospital for Children, London, on December 4, 1877, when he had been ill about a week. He subsequently passed through a severe attack of enteric fever complicated with peritonitis. After December 22 his temperature became subnormal in the evening. On the evening of the 29th the temperature rose to 102° , and on the following evening to 103.5° . On the 31st the lad complained of a constant pain in the left inguinal region. The thermometer now again fell below normal, recording 96° on January 3, 1878. On the evening of this day he again became feverish, the thermometer rising to 103° . Next morning he was fever-free, but paralysed on the right side, without any lesion of speech. He steadily improved from January 6, but even at the end of February still dragged the right leg, while the right arm and hand also showed considerable loss of power.

In the same number of the *Medical Times and Gazette*, Dr. Garlick, Registrar of the Hospital for Sick Children, Great Ormond-street, London, reported the case of a boy, aged seven years and eight months, who was admitted under the care of Dr. Gee, July 9, 1877. Seven weeks before admission this child fell ill of enteric fever, the attack lasting five weeks. He was recovering when, two weeks before admission, he was seized with a fit and foamed at the mouth. Next morning the boy was found to have lost the power of speech and to be unable to use the right side of his body. The aphasia proved to be of the ataxic rather than the amnesic form. There was well-marked early rigidity of the right arm. The boy recovered slowly, but at the end of September was still aphasic to a certain extent. Dr. Garlick assumes that a patch of embolic softening had taken place in Broca's region from plugging of a branch or branches of the left middle cerebral artery, the plug being derived from some broken-up fibrin

in the left auricle. William Osler (*The Principles and Practice of Medicine*, 3rd edition, 1898, page 38) states that hemiplegia is a rare complication of enteric fever. Francis Hawkins has collected 17 cases from the literature; aphasia was present in 12. The lesion is usually thrombosis of the arteries, less often a meningo-encephalitis. The aphasia in children often disappears.

The case which I submit in this communication is that of a married woman, aged twenty-nine, who progressed favourably until the 27th day of her fever, when the temperature began to rise again, pain set in on the left side of her chest accompanied by a choking sensation and "Luft-hunger," great exhaustion and profuse sweating. This attack was evidently due to the occurrence of embolism in the spleen. On the 39th day of the fever there was a very severe rigor, and the thermometer quickly ran up to $105\cdot6^{\circ}$. These grave symptoms were speedily followed by complete right hemiplegia and aphasia, death ensuing on the 53rd day.

For the notes of the case I am indebted to the Staff-Sister in charge of the epidemic wing of the Meath Hospital—"Sister Helen" (Miss Campbell).

CASE.—Mrs. M. B. entered the Meath Hospital as a patient on the 8th of November, 1898. She said she had been quite herself till about the 1st of November, after which she felt out of sorts; had no appetite; complained of pains in her back and legs; epistaxis; violent frontal headache. Not improving, she thought she would seek advice, and came over to the Meath, where Dr. J. W. Moore saw her, and sent her into the West Wing.

November 8th.—On examination she was found to be suffering from enteric fever. The diagnosis was verified by Widal's test. Temperature not very high. Patient did not appear to be very bad.

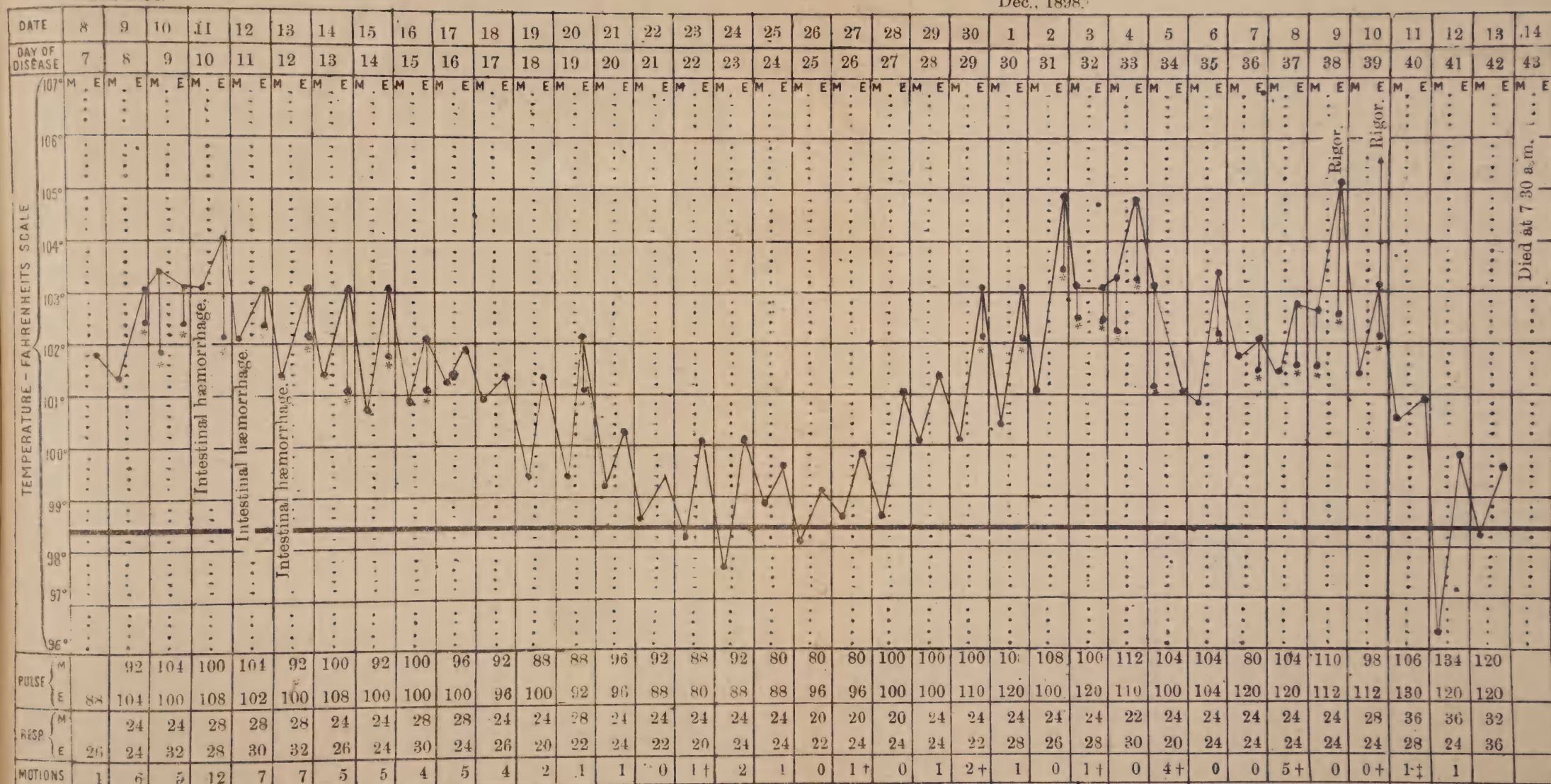
November 9th.—Temperature rising; very profuse diarrhoea.

November 11th.—Several rose spots appeared on abdomen. Without any warning or drop of temperature profuse intestinal

MRS. MARY B. Age—Twenty-nine. Disease—Enteric Fever. Result—Death.

Nov. 1898

Dec., 1898.



* After sponging.

† Castor oil.

‡ Enema.

hæmorrhage came on. This continued for three days. Great resulting prostration; tongue very dry and brown.

November 15th.—Temperature fairly steady, but pulse weak; hæmorrhage quite stopped; diarrhœa much less. Patient complained of shooting pains in legs from thighs down, and sometimes going up to abdomen; very weak, so that she could not turn in bed.

November 20th.—Temperature coming down nicely; pulse a little stronger; constipation.

November 28th.—Temperature rising again; pulse much weaker and quicker. Patient complained of a pain in left side of chest, and a choking sensation, as if she could not breathe freely. Pains in her legs quite gone; great exhaustion; profuse perspiration.

December 4th.—Temperature keeping up; slight rigor during night; all symptoms exaggerated; slight delirium; pulse very weak and dicrotic.

December 9th.—Patient much worse; hardly conscious, but taking all nourishment, medicine, stimulants.

December 10th.—Very severe rigor; temperature reached $105\cdot6^{\circ}$; pulse could hardly be felt; quite unconscious.

December 11th.—Temperature down; right side of body completely paralysed; could not move right leg or arm; the right side of face was very drawn. Patient could not speak; she was quite conscious; looked very distressed; could take only teaspoonfuls of nourishment.

December 12th.—Collapse; Dr. Moore observed that there was very marked reduplication of first sound of the heart; pulse can hardly be felt; very rapid and shallow breathing; still able to take a little nourishment, and quite conscious.

December 13th.—Patient sinking fast.

December 14th.—Patient died quietly at 7 30 a.m.

The following is a report on the pathological conditions found *post mortem* by Mr. C. B. Pasley, Clinical Clerk:—

1. *The Cerebrum*.—The centrum ovale majus and minus having been exposed, it was observed that the white matter of these parts on the left side was softened and congested. On making sections through the lower portions of the brain the central grey nuclei and the surrounding white matter were seen to be softened and congested. It was further found that embolism of the left middle cerebral artery had occurred.

2. *The Heart*.—This organ was pale in colour, and soft in consistence. *Ante-mortem* clots were found in the left ventricle and left auricle.

3. *The Spleen*.—An enormous hæmorrhagic infarct was found to have occurred—indeed it was almost as large as half the size of a normal organ. It occupied the central portion of the viscus.

4. *The Intestines*.—On examining the ileum, evidences of past ulceration of Peyer's patches were seen in the lower two or three feet of this portion of the intestine. The ulceration had been for the most part shallow and confined to small areas. One or two large and deeper ulcers were, however, found near the ileo-cæcal valve. In nearly all cases the sloughs had separated.

There can be little doubt that the chain of incidents which led to the final catastrophe in this case was—(1) Typhoid softening of the myocardium; (2) consequent clotting in the left chambers of the heart; (3) embolism of the splenic artery; and finally (4) embolism of the left middle cerebral artery. The exact time at which the successive embolic attacks occurred is marked by the rigors and sudden ensuing rises of temperature. The splenic infarction clearly coincided with the left-side pain and choking sensation felt by the patient on November 28. The cerebral infarction took place on December 10, nearly a fortnight later, when there was a very severe rigor and a bound of temperature to 105·6°.

Dr. William W. Keen, in his recently published work on the “Surgical Complications and Sequels of Typhoid Fever,”^a states that it is not uncommon to find *ante-mortem* clots in the cavities of the heart. He quotes Forgues, Beaumanoir, Fritz and Valette as having all recorded autopsies with such findings. According to Keen these clots are formed probably during the period of cardiac weakness, especially in the second and third weeks of the fever, and, as the heart begins to regain its force and lose its frequency, are washed into the circulation as emboli.

^a London: The Rebman Publishing Co. 1893. Page 59.

In the viscera their presence is shown by multiple infarcts ; in the legs by the occurrence of gangrene.

At least two investigators—Rattone and Haushalter—have found Eberth's *Bacillus typhosus* in thrombi. The latter observer thinks that in all probability the ferment necessary to produce coagulation of the blood is to be found in the products of the bacilli. Keen points out^a that the bacilli of enteric fever are not commonly discovered in the blood. When present, they are most numerous during the first twelve days of the disease. It is probable that they reach the blood by the lymphatics, since they are, according to Déhu,^b found in abundance in the thoracic duct. That the bacilli must exist in the blood and be diffused by it is proved by their detection in the placenta and foetus in cases of abortion in enteric fever. Widal, Chantemesse, Eberth himself, Etienne and Giglio, amongst many others, are responsible for this statement.

In the light of the foregoing, it is interesting to note that in my patient the first embolic attack occurred on the 27th day, after the pulse had been for three consecutive days as slow as 80 per minute.

As regards the intimate nature of the change in the myocardium so often observed in enteric fever, Arthur E. Sansom inclines to the opinion that it results from a true myocarditis. It is, however, open to question whether there is any inflammation in the strict sense of the term. Zenker's so-called hyaline degeneration of the muscular fibres is most commonly present. Less frequently there is the granular degeneration of the fibres to which the name "cloudy swelling" has been given. From both these forms of degeneration the heart muscle may entirely recover. Hence it is that after neither typhus nor enteric

^a Loc. cit. Page 23.

^b Thèse de Paris. 1893. Page 59.

fever is there any permanent heart-disease—a fact long since insisted upon by William Stokes.

DR. E. J. McWEENEY asked Dr. Moore how he accounted for the coagulation of the blood in the left side of the heart by myocardial changes. Apart from some endocardial change, it was not clear how he accounted for the formation of the thrombus. Was a microscopic examination of the spleen made with a view to discovering the typhoid bacillus? Was the sero-diagnostic test applied during life? Regarding cerebral implication in the course of general infective diseases, a most remarkable case which had come under his notice was that of a late distinguished Fellow of that Academy, in whose case the pneumococcus of Fraenkel became localised in the meninges after the morbid process to which it gave rise had been successfully overcome in the lung. He had seen a case of typhoid fever last winter, in which the symptoms which prevailed during the entire course of the attack were indistinguishable from meningitis, and the real nature of the case was only ascertained by Widal's reaction.

DR. R. TRAVERS SMITH asked Dr. Moore if a microscopic examination of the myocardium had been made, and did it exhibit parenchymatous or fatty degeneration? Was it from clinical or *post-mortem* experience that he had made the statement that enteric fever is one of the fevers which most profoundly affects the myocardium?

DR. J. W. MOORE, in reply to Dr. McWeeney, said that the endocardium was perfectly healthy, and in it there was nothing to account for the *ante-mortem* clotting. He attributed the clotting to the extremely feeble action of the heart which existed for the last ten or twelve hours of life. The spleen was not examined for Eberth's bacillus. Widal's reaction was positive. In reply to Dr. Smith, he said that in speaking of profound changes of the heart he was speaking generally and not with regard to the present case, in which no minute examination of the heart muscle was made. Cardiac failure not infrequently did lead to death in enteric fever. He spoke solely from clinical experience on the subject.

THE HISTOLOGY AND BACTERIOLOGY OF A CASE OF MULTIPLE ABSCESS OF THE LIVER, ASSOCI- ATED WITH CARCINOMA AND GALL-STONES.

By E. J. McWEENEY, M.A., M.D. (R.U.I.), L.R.C.P.I.;
Professor of Pathology and Bacteriology, Catholic University Medical
School, &c.

[Read in the Section of Pathology, March 24, 1899.]

THIS communication is based upon the liver of a woman aged nearly seventy, who suffered from severe and persistent jaundice for several months before death, and was thought to have cancer of the liver. *Post-mortem*, the organ was not much enlarged (weighed 60 oz.) and was studded on the surface and throughout with hundreds of small abscesses, varying in size from a pin's head to a hazelnut, and containing a greenish pus, thick and inodorous. The larger bile-ducts were greatly dilated and contained an inspissated bile mingled with soft, gritty concretions. The common bile-duct was large enough to hold the little finger, and contained several crumbling calculi, one of which quite blocked the passage into the duodenum. The gall-bladder was non-existent, its position being occupied by a solid white nodule about the size of a walnut, to which the duodenum was firmly adherent. The microscopic structure of this was very remarkable. One end of the sections showed somewhat cirrhotic liver-tissue, with a good deal of leucocytic infiltration of the periportal tissue, and some proliferation of the bile-ducts. The liver cells gradually became fewer and less distinct, and merged gradually into a tissue consisting of large cells with nuclei richer in chromatin, and staining a deeper hue with Ehrlich's hæmatoxylene. They were devoid of pigment granules in their protoplasm. These cells were

undoubtedly hepatic cells that had undergone malignant transformation—Hansemann's *metaplasia*. Further over in the section these might be seen to take on a gland-like tubular arrangement like dilated bile-ducts; and further on still the neoplastic ducts were seen to be converted, by proliferation of their lining cells, into solid epithelial strands, precisely like those met with in ordinary breast cancer. The centre of many of these alveoli was occupied by a solid mass, consisting of oyster-shell-shaped scales closely packed. These masses took the Ehrlich's hæmatoxyline so deeply that they appeared nearly jet black. They appeared to consist of necrotic and altered epithelium, apparently forming the nucleus of minute calculi. Similar structures, but larger, were found in sections of the larger bile-ducts elsewhere in the liver, and corresponded to the gritty masses seen at the autopsy.

Histologically the transition from liver-cells laden with pigment, and with "resting" nuclei poor in chromatin, to the malignant neoplastic cells was deeply interesting, and so was the gradual evolution of the cancer-form, through a tubular type to a pure alveolar arrangement without a trace of lumen.

The Cystic Duct seemed to be represented by a solid cord about $\frac{1}{8}$ in. in diameter, consisting of cancerous tissue. The wall of the numerous small abscesses was composed of flattened layers of hepatic cells, which gradually became necrotic as the abscess was approached. The abscesses were not demonstrably contained in the bile-ducts, nor associated with the portal vein. Organisms were hard to demonstrate in the pus; but cultivations proved it to contain two varieties of *Bacillus coli*, distinguished by their appearance on gelatine plates and on potato. Both were highly virulent for animals (rabbits), and produced abundance of indol. The autopsy was made a few hours after death, so that *post-*

mortem immigration need not be assumed. Exhibitor was inclined to look upon the organisms as the primary ætiological factor, then came the calculi, and finally the conversion of the gall-bladder into a solid mass of neoplasm.

[DR. D. F. RAMBAUT also exhibited specimens of primary carcinoma of liver, with enormous enlargement of spleen.]

DR. EUSTACE asked, with reference to Dr. Rambaut's specimen, if there was any evidence of collateral circulation in the spleen.

DR. LITTLEDALE thought that there was no doubt about Dr. Rambaut's specimen being one of primary cancer, as the normal liver tissues could be actually seen undergoing transformation into cancerous tissue. He thought that liver abscesses, in Professor McWeeney's case, resembled kidney abscesses in that in the case of the kidney it has been stated that when *Bacterium coli* is found in the urine with symptoms of pain about the kidney, it was a pretty certain sign of stone in the kidney, and it has been said that the presence of the stone in the kidney allows the *Bacterium coli* to get through the abraded membrane of the pelvis of the kidney.

DR. J. W. MOORE said that the enlargement of the spleen in Dr. Rambaut's case was most interesting and very unusual in carcinoma of the liver. There must have been very considerable pressure on the portal vein to cause the condition. The bacteriological origin of gall-stones was very interesting. It has been observed that patients recovering from typhoid fever have become subject to gall-stones, and probably it is really a manifestation of the localisation of Eberth's bacillus producing a deposition of cholesterine and lime salts.

DR. KNOTT asked if there was a large quantity of ascitic fluid in Dr. Rambaut's case.

DR. RAMBAUT, in reply to Dr. Eustace, said that there was a varicose condition of the gastric and œsophageal veins, and also the veins behind the peritoneum. In asylum *post-mortems*, only about one-twelfth of the cases of cancer of liver were primary. Perhaps the cirrhosis of the liver would account for the portal obstruction in this case. With reference to Dr. McWeeney's case he said that he had lately made a *post-mortem* examination on a woman who died of consumption, and found four abscesses in the liver. From

the pus obtained he got almost a pure culture of *Bacterium coli*.

DR. McWEENEY, in reply, said that he had lately seen a very large kidney completely riddled with small abscesses containing a creamy pus which contained one organism only—the *Bacillus coli*—in prodigious numbers, and they could be seen easily filling up the urinary tubules. Without doubt the process had penetrated from the pelvis through the papillæ along the straight tubules, and had excited suppuration from the interior of the urinary tubules outwards. The same thing is constantly found in what are unjustly called “surgical” kidneys. In cases of typhoid fever, it was his experience to find Eberth’s bacillus invariably present in the gall bladder. Cases are on record where, in cases of typhoid fever, the typhoid bacillus was found twenty years afterwards in the gall bladder. In fact, the bile seemed to be an ideal medium for the long preservation of the life of various pathogenic species of bacteria.

A CASE OF ULCERATIVE ENDOCARDITIS DUE TO THE PNEUMOCOCCUS OF FRANKEL, AND CONSECUTIVE TO SO-CALLED ETHER-PNEUMONIA.

By E. J. McWEENEY, M.A., M.D. (R.U.I.), L.R.C.P.I.;
Professor of Pathology and Bacteriology, Catholic University Medical
School, &c.

[Read in the Section of Pathology, May 5, 1899.]

ON the 24th February of this year I had the honour of bringing under the notice of this Section a case in which infective endocarditis, associated with septicæmia, had supervened on ordinary croupous pneumonia. I now beg to lay before you a case in which ulcerative endocarditis came on after the so-called ether-pneumonia and cost the patient her life.

History.—Patient was originally admitted under the care of Mr. Chance to the Mater Misericordiæ Hospital, on Dec. 4th, 1898, suffering from vomiting, with symptoms of pyloric obstruction. There was a tumour the size of an orange in the epigastrium. On the 16th the abdomen was opened, and the stomach found constricted by a fibrous band, which caused it to assume an almost hour-glass shape. The band was divided. Pain and vomiting ceased as the result of the operation, and patient left the hospital apparently cured on January 15th.

Three days after the operation the patient developed croupous pneumonia of both bases. Temperature remained up (102°) only two days, and then fell, but did not quite reach normal till the 15th day. The case was looked upon as one of ether-pneumonia.

On February 20th she was re-admitted with high fever, quick pulse, and muttering delirium. There was a loud

mitral murmur. Death took place on the 25th, and the autopsy revealed the following conditions:—

Heart.—Somewhat hypertrophied, flaccid; no marked fatty change. Left auricle much dilated; into it projected a greyish, friable mass as big as a small walnut. This sprang from the auricular face of the mitral cusps, to which it was, however, not very firmly adherent. On raising the mass which was already in part detached, the underlying endocardium was absent, and its place occupied by a grey, sloughy surface. On the ventricular aspect of the mitral valve was another lobulated fibrinous mass of about the same size. It sprang from the cusps, to which it adhered firmly, and filled up the intervals between the chordæ tendineæ. These were softened, discoloured and ulcerated where they passed through the fibrinous mass. There was no obvious myocarditis.

Pericardium contained a good deal (100 cc.) of reddish serum.

The lungs were œdematous and congested behind and below. Some recent soft adhesions of both pleuræ.

Stomach.—Somewhat dilated; a sort of cicatricial puckering at middle of lesser curvature; around this numerous adhesions, binding the stomach to spleen and liver. The pancreas firmly adherent to the back of the stomach close to this spot. On dissecting up this adhesion a cavity of irregular shape was opened. It was bounded by pancreas, inspissated connective tissue and stomach, up to which it ran at a point on the posterior surface near the middle of the lesser curvature, where the mucous membrane showed a smooth, circular, slightly depressed cicatrix, the size of a shilling piece. Round this the mucous membrane was thrown up into exaggerated rugæ.

Mesenteric Glands.—Several were as large as marbles, and on section dry and cheesy.

Spleen.—Normal in size, very soft; a few small wedge-shaped infarcts.

Kidneys.—Right enlarged; capsule came away at once, leaving a bright red, mottled surface with a large, pale, wedge-shaped area. On section this corresponded to an enormous infarction, pale, almost cheesy, with bright red edges; sprinkled over the cut surface were many other smaller infarcts, some wedge-shaped and abutting on the periphery, others altogether in the parenchyma and of various irregular shapes. One of the primary branches of the renal artery—that which supplied the infarcted region—was plugged with a firm red thrombus.

Left.—As large as its fellow; paler and not unlike a large white kidney. No infarcts.

Liver.—Somewhat “nutmeg.”

Ovaries.—Left normal. Right twisted on the broad ligament, converted into a mass the size of a hen-egg, resembling apple-jelly (hæmatoma).

Microscopically and culturally the diplococcus of Frankel was the only organism found. It was present not only in the fibrinous vegetations on the mitral but also in the infarcts of the right kidney.

In conclusion, I may remark that this case would seem to render it probable that the so-called “ether-pneumonia” may, like other forms of pneumonia, be due to the lancet-shaped diplococcus. The sub-diaphragmatic abscess, with antecedent healed ulcer of the stomach and the hour-glass condition of that organ relieved at operation, are also points of great, but chiefly surgical, interest upon which I do not intend to enter this evening.

DISLOCATION OF THE METATARSUS.

By E. H. BENNETT, M.D., F.R.C.S.;

Professor of Surgery in the University of Dublin;
President of the Royal Academy of Medicine in Ireland.

[Read in the Section of Pathology, May 5, 1899.]

THE dislocation of the bases of the metatarsal bones are of interest in consequence of their rarity, the difficulties in their diagnosis, and the resistance which some present to reduction.

In the early years of this century the possibility of their occurrence was denied. Now all surgical writers recognise them, and that, while all their varieties are rare, the number of these varieties is very considerable. I had, in March of this year, the opportunity of seeing and treating a recent example, and think it worth while to record its details. Several years ago I met and treated another, which I have not before recorded for a reason which will appear as I submit the case to the Academy.

The facts of the case which occurred this year are these:—

An able-bodied man, aged forty-two, was engaged early in the morning on 4th March in raising, with some fifteen men, a baulk of timber weighing about two tons. They were about to build a gangway into a ship beside the quay, and the baulk of timber was to form one of the two principal parts of it. As one end rested on the ground the men attempted to raise the other. They had lifted it a moderate height when they gave way and let it fall. My patient's flexed knees were beneath the timber, and as it fell it slid down the fronts of his thighs, grazing them so that the skin was bleeding over a large surface in each limb. As it slid free of the knees he fell forward over the timber, so that his feet escaped any direct crush, but had been extended to the utmost while the weight

pressed the thighs. In the left foot the arch gave way, and the metatarsal bones were dislocated upwards and outwards upon the tarsus. After the accident the pains of his thighs were such that he did not appreciate the injury of his foot. He was carried on a dray to Sir P. Dun's Hospital, reaching there about seven a.m. He was placed on a couch in the accident room pending the preparation of a bed in my ward. I saw him a few minutes after nine a.m., and proceeded to make the diagnosis. The wounds of the thighs had been dressed antiseptically, and, although they were very painful, did not appear of much importance, as the deep structures and the femora and patellæ were unbroken. I found the left foot greatly swollen, and with the eye alone I could not recognise the nature of the injury. The sole of the foot was flat, not convex either from side to side or from before backwards. The swelling of the soft tissues so obscured the outlines of the bones that it was quite useless to take a cast of the limb. In describing the dislocation of the metatarsus upwards on the dorsum of the tarsus, Professor R. W. Smith lays great stress on the appearance of the sole of the foot as he saw it, and has figured it in his book. He says—"Instead of presenting its natural concavity, the plantar region becomes convex both in the antero-posterior and transverse diameters, and hence it is that in standing or walking the central third alone, or nearly so, of the outer margin is presented to the ground." I think this difference between my case and those recorded by Professor Smith is probably due to the amount of outward displacement in the former, as contrasted with the more directly upward dislocation in the latter.

On handling my patient's foot I was able to make out on the inner border of the tarso-metatarsal joint that the first metatarsal bone was displaced upwards and outwards so as to occupy and project above the normal site of the second bone at its base. I could make out the articular face on the distal side of the internal cuneiform bone. The second metatarsal could be traced resting on the dorsal surface of the tarsus much outside its normal position. The third and fourth bones lay on the dorsal surface of the cuboid, and the fifth lay projecting free of that bone, unsupported by any bone. As far as I could determine, there was no fracture of the base of the second metatarsal, a fact which shows that, in the production of the dislocation, the bones were first displaced directly upwards, subsequently outwards.

I secured a bandage by Hey's knot to the metatarsus above the

ball of the great toe, and made traction with my right hand while I pressed on the dorsal tumour with my left, and so readily reduced the bones almost completely into place. A skiagraph shows that a very slight outward displacement still remains, and that the base of the second metatarsal has not been broken.

My second case was a dislocation of the first, second, and third metatarsals downwards into the sole of the foot. It occurred in this way:—A young, healthy man was driving a cart from which he had discharged a load of potatoes one summer's morning. As he drove at a trot, with his legs hanging over the shaft in front of the wheel, in turning the corner of Clarence-street, the horse shied and brought the cart foul of a lamp-post. The toe of the man's boot struck direct against the post, while the heel was forced against the tire of the wheel. The man was carried into Sir P. Dun's Hospital, nearly opposite to which the accident took place. I was in the hospital at the time and saw the man immediately. When his foot was stripped the diagnosis could be made by the eye alone, for the contour of the articular surfaces of the three cuneiform bones were traceable beneath the skin, which was drawn tight over them by the downward dislocation of the inner side of the metatarsus. Recognising the injury and its rarity, I desired to take a cast of the deformity, but there was no plaster of Paris in the hospital, so I had to send for some. I was anxious that some senior surgeon should verify my diagnosis and help me in the reduction. At the time I was the junior surgeon of the hospital, and my senior colleagues were away on their holidays. So I went for the late Christopher Fleming, and he promised to be with me in a couple of hours' time. I went to take the cast, and did so, but in the interval of a couple of hours the foot had swelled so greatly that nothing of the former facility of diagnosis remained, as the cast I now submit shows. One could with difficulty make out the bony outlines in the dorsal tumour. When Mr. Fleming arrived I put the patient under chloroform in his bed, because of the excessive pain of his foot. I did my best to take hold of the metatarsus with a dislocation knot, but at every attempt the knot slipped over the swollen foot without the dislocated bones moving in the least. Mr. Fleming took out his own large silk pocket handkerchief and hitched it on to the metatarsus, and gave it to me to make the traction; the counter-resistance I effected by getting into the bed and pressing the dorsal tumour formed by the projecting cuneiforms with my left knee. In this way I had a very full power over the

parts, and the handkerchief held firm. After a few moments' traction the dislocation reduced with a loud snap, and not many days after the man went home well.

The category of these dislocations of all kinds in 1865 was estimated at 29 by Hitzig. In 1891 Hoffa has added 11 records, making in all, at that date, 40. No doubt a search of the records would show a few more now. Vastly the more common are the upward dislocations either direct or direct with secondary displacement outward. The only examples of the downward dislocations that are referred to in the current literature are Mr. Tufnell's, with which the case which I have just read agrees exactly except in one point—namely, that although seen shortly after its occurrence, and recognised, it remained unreduced. Here is the cast of it, which I have recovered in the museum of this college, where it has kept its place among the specimens relating to injuries of the foot, but has been wrongly catalogued. Mr. Joisah Smyly recorded a case of the dislocation of all the metatarsal bones downwards which was easily reduced. It, too, was caused by pressure lengthwise on the foot. I do not know any other recorded examples of the downward dislocation.

DR. KNOTT had seen one of Dr. Bennett's cases. In Dr. R. Smith's cases the five metatarsal bones were displaced upwards and backwards *en masse* on the tarsus, and the first metatarsal bone was accompanied by a piece of the internal cuneiform bone. The deformity was similar in each case. In Professor Bennett's case he thought that the displacement became more exaggerated, as it travelled from the inside to the outside, that the first metatarsal was least displaced, and also that the bones were somewhat "scattered." There was no over-riding which would cause foreshortening of the foot, nor was the displacement upwards quite complete.

CENTRAL SARCOMA OF BONE.

By W. I. WHEELER, M.D., F.R.C.S.;

Surgeon to the City of Dublin Hospital.

[Read in the Section of Pathology, May 5, 1899.]

THE specimen I am about to show is a left lower limb of a female, aged twenty-five years, by avocation a domestic, who was admitted into the City of Dublin Hospital upon the 28th of February of this year. She was a spare and delicate-looking woman, of nervous temperament, and suffered from an enlargement directly below and inferior to her left knee-joint; there was no effusion into her knee-joint, nor was this joint enlarged. Her history did not detail any injury, and the existence of the swelling was only noticed in November of last year, when her attention was attracted to the enlargement by the fact of being unable to bend her knee without pain. She was not anxious at the time, and did not think that the enlargement was of much consequence, and worked as usual, walking without any pain, provided her leg and knee-joint were in the extended position. In December last the swelling was noticeable on the external aspect of the limb below the knee. At this period she sought medical advice; the treatment consisted of plasters and blisters. She did not derive benefit; the enlargement gradually increased, but there was not increase of pain—in fact, not at any time was much pain experienced. Occasionally, what she describes as a throbbing pain occurred when her limb was at rest, but never until her admission was the discomfort and pain excessive.

In January last, by advice, she kept her limb in the extended position, and did not walk scarcely at all; when she did, she had considerable pain, and also after walking, no matter what position she kept her limb in. She assigns no cause for the affection, and there would appear to be no heredity, as both her parents are alive and healthy, also one sister and five brothers; there was only one death in her immediate family—one sister, a child, who died of measles.

Although I have had three very similar cases to the one above described I did not record a definite diagnosis for some time, for this case differed in several particulars from the other cases in the absence of pain, in absence of thickening of the tissues, and increased density. In this case on examination one's finger would sink into a sulcus about three inches in length. In the other cases there was considerable pain almost from the inception of the disease; there was thickening of the parts in two of the cases.

In March last I operated upon this patient by making a longitudinal incision over the enlargement; it was then quite evident that the anterior surface of the tibia to the extent of three inches in length and three and a half circumferentially had been destroyed, and this accounted for the depression or sulcus. The cavity was filled with broken-down material, which I scraped carefully away, and finally douched out the cavity formed in the bone. Not a particle of tissue remained as far as could be ascertained, and assisted by artificial light, the patient's knee-joint was intact. The treatment that followed is not within the province of this communication; suffice it to say that consequent upon some enlargement of the knee-joint and for very considerable pain I amputated her leg above her knee-joint.

The specimen examined proved to be a myeloid sarcoma

(the least malignant of the sarcomata); progress arrested by articular cartilage. The growth most likely in this case was from the medulla causing the great local expansion of the bony wall. The specimen is rich in giant cells. These tumours are seldom or ever composed wholly of giant cells, but the giant cells are usually embedded in a matrix of spindles, and it is often a question whether the tumour is to be ranked as a spindle-cell sarcoma with giant cells added, from the fact of its having grown in connection with bone, or as a distinct variety of sarcoma. In cases such as malignant epulis the tumour appears to be simply a spindle-cell sarcoma invading bone, destroying it, and liberating the bone corpuscles, which develop into giant cells.

Of the four cases which came under my notice, all in the same situation—all described after careful examination to be myeloid sarcomata—two recovered by the minor operation, scraping out the growth; two had to be amputated. The question naturally arises is it possible when there is so much spindle-celled element to say positively that it was not a spindle-celled sarcoma, but a myeloid? are the pathological myeloplaxes different from the normal giant cells of the marrow, which some look on as osteoclasts? There was no tendency to the formation of bone in the specimen shown which is often formed in myeloid sarcoma.

DR. E. J. McWEENEY said that the two microscopical sections which he had prepared for Mr. Wheeler showed an enormous number of giant cells or myeloplaxes. The tissue resembled normal bone marrow, with an extreme multiplication of the myeloplaxes. The cells were of positively gigantic proportions, and some possessed about a hundred nuclei. The nuclei of many of the smaller round cells showed the mitotic figures,

but there was no evidence of the mitosis in the nuclei of the myeloplaxes. Concerning the origin of the myeloplaxes, Schäfer's picture represented the nuclei lobulated as though undergoing direct division, but he (Dr. McWeeney) thought this very improbable. Mr. Wheeler's suggestion that such tumours should be removed out of the class of sarcoma and called myelomata was impossible, because the term myeloma was already appropriated to a kind of tumour which is not identical with Mr. Wheeler's. Weichselbaum's book described myeloma as a variety of small round-celled tumours growing from the marrow of bones, but not reproducing the giant-celled structure of marrow. It was multiple, and originated either from skull bones or the bones of the vertebral column, occurring in elderly people, and was often associated with blood abnormality, so that Weichselbaum looked upon it as a part of leukæmia or pseudo-leukæmia rather than a distinct tumour. Regarding the tissue from which they originate, Mr. Bland Sutton laid stress on the fact that periosteal sarcoma never contains giant cells. Mr. Jackson Clarke states that some periosteal sarcomata have a giant-cell character, and this was also the speaker's opinion, based on experience of a good many such growths. As for the proposition of removing such tumours out of the sarcomata, he thought it impossible, for the simple reason that there was an unbroken chain of intermediate links between a round or spindle-celled sarcoma, with a very few giant cells, on the one hand, and a sarcoma crowded with such cells on the other hand. In Mr. Wheeler's specimen there was no tendency whatever to the formation of spicula of bone often characteristically formed in myeloid sarcomata.

DR. J. M. PURSER said that in the marrow of normal bones the cells resembling the myeloplaxes are most commonly met with in young bones, and are very rare in the marrow of adult animals. Large cells were exceedingly common, but had not multiple nuclei, but generally one nucleus of very irregular shape, and extremely lobed and bossy, many of the lobes often connected together by small threads or processes, but they were not nuclei dividing. He thought that the pathological myeloplaxes were something different from the normal giant cells of the marrow, which he looked on as osteoclasts. These cells showed multiple nuclei, and very rarely karyokinetic figures. How the nuclei divided in giant-celled sarcomata he did not know. He lately saw a tumour which grew from a goat's jaw which proved to be a

fibrous sarcoma, in which there were enormous numbers of giant cells often arranged around bone undergoing absorption, while in other places the bone had entirely disappeared, and there was nothing but giant cells.

MR. WHEELER, in reply, said there were no bony growths thrown out in the tumour. He would like to know if material like that occurring in the tumour shown by him was taken out of a similar case, could it be possible, seeing that there was so much spindle-celled element, to say positively that it was not a spindle-celled sarcoma, but a myeloid sarcoma.

VASCULAR TUMOURS OF THE ABDOMINAL WALL.

By R. CHARLES B. MAUNSELL, M.B., &c. ;

Surgeon to Mercer's Hospital.

[Read in the Section of Pathology, May 5, 1899.]

THE following cases I wish to bring under the notice of this Section of the Academy:—

CASE I.—A young lady, Miss F. K., aged twenty-two years, was sent to me by my colleague, Dr. Glenn. She stated that since she was a young child she had noticed a lump in her left side just below the costal margin, but that latterly it had increased in size and caused her considerable pain. On examination I found an elongated sessile tumour as large as an adult hand with the fingers held semi-flexed and in apposition. The upper end of the tumour lay over the left lower ribs in the anterior axillary line, and the lower end reached a point internal to the left anterior superior spine of the ilium. Pressure on the tumour caused considerable pain. The consistence of the mass varied, some parts feeling tense and some soft and lobulated; the edge was not well defined; the skin was movable except in the centre of the growth where it appeared to be deeply adherent. A diagnosis of lipoma with cysts was made, but no opinion given as to the nature of the cyst contents.

On October 20th, 1898, I operated, first making an incision into the centre of the tumour opening a cyst as large as an egg, and from this breaking open several other cysts with a scissors. The fluid in the cysts was clear like serum. I next made an elliptical incision surrounding the adherent portion of skin, and then dissected out the mass laying bare the abdominal muscles. The edges were very ill-defined, and several smaller cystic spaces seemed to branch out into the subcutaneous tissues at the upper and posterior margins. These I laid open with a scissors, and closed the wound entirely by deep and superficial silk sutures. Convalescence was uneventful, the sutures being removed on the seventh day, when the wound was entirely healed, and the patient was discharged November 2nd, thirteen days after operation.

The parts removed were examined by Dr. H. C. Earl, who reported that they consisted of adipose tissue connecting together several cysts of various sizes lined by endothelium and containing smooth muscle in their walls. He considered that they were of lymphatic origin. I consider the tumour interesting, as it is evidently of the same character as those rare tumours of the neck called cystic hygromata.

The after-history of the case is of interest, as about ten days after her discharge she came to me stating that the lower part of the scar felt sore. On examination I found that she had evidently scratched the scar, and there was a typical blush of erysipelas spreading from it. In spite of treatment this spread, and she passed through a very severe attack of cellulito-cutaneous erysipelas which necessitated several free incisions. The true area of lymphatic enlargement was well defined by this time, as the swelling spread almost to the spine behind and half way up the ribs towards the axilla.

I am happy to say the patient recovered in a few weeks and is to-day in perfect health and has no sign of any abnormality. This attack of inflammation still further makes the tumour resemble the cystic hygromata, as it is well known how prone they are to severe attacks of inflammation following the least interference.

CASE II.—A baby, eleven months old, sent to me by Dr. Flannery, of Tubbercurry, County Sligo. On examination the patient seemed to be a well-grown boy for his age, but looked very white and fretful. On his head, in the region of the lambda, was a prominent nœvoid growth of the size and appearance of a raspberry. On the abdomen was a large ulcerated, painful, purple tumour, which bled on the slightest irritation. It was raised above the surface one centimetre in its thinnest portions and two centimetres in its thickest portions. It measured sixteen and a half centimetres ($6\frac{1}{2}$ inches) across and eleven and a half centimetres ($4\frac{1}{2}$ inches) vertically. It almost filled the right hypochondriac and lumbar regions, and encroached on the right iliac region and on the right side of the umbilical region; in fact, it covered fully a third of the infant's abdomen.

The mother stated that shortly after birth she noticed a small

red spot about the size of a pin's head in the position of the present growth, and that it had steadily increased ever since. She stated that the small tumour on the child's head had only appeared lately. Seeing that the tumour was growing rapidly and bleeding freely, notwithstanding its large size and vascular nature, I determined to remove it. I first removed the small growth from the scalp, and, whilst the infant was under the anæsthetic, thoroughly examined the connections and movability of the larger one. A week later, July 26th, 1898, I again gave the child an anæsthetic and removed the larger mass in one piece by a specially devised operation, and stitched up the large wound thus resulting. There was only about an ounce of blood lost during the operation, and the child recovered uneventfully and was discharged within a month. I heard lately from Dr. Flannery that the result has been a perfect success, and that there is no sign of any recurrence in either situation.

The tumour was examined by Dr. H. C. Earl, who reported that it was a nævus composed of veins and capillaries. The chief point of interest for this Section of the Academy is the rapid growth of the tumour, the details of the operation being too purely surgical to warrant any description on my part.

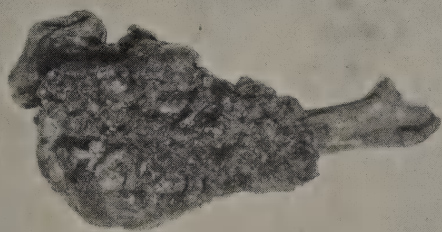
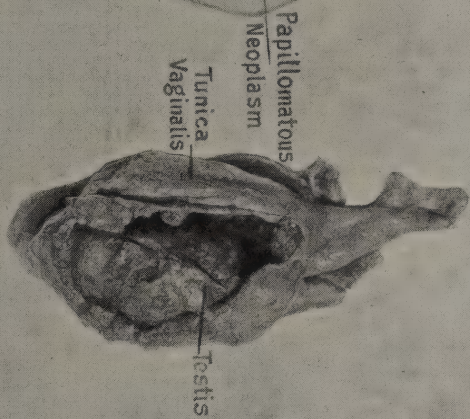
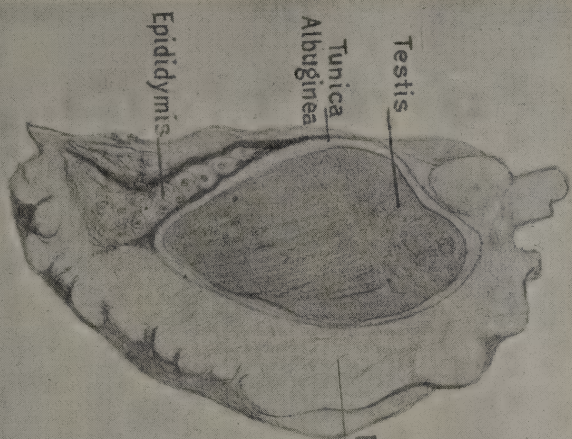
MALIGNANT PAPILLARY NEOPLASM OF THE TUNICA VAGINALIS TESTIS.

By P. J. FAGAN, F.R.C.S.;

Assistant Surgeon, St. Vincent's Hospital.

[Read in the Section of Pathology, May 5, 1899.]

J. K., a tobacconist, aged sixty-six, consulted me at the out-patient department of St. Vincent's Hospital in June, 1898, on account of a swelling in his scrotum. Nothing worthy of note in his family history could be elicited. His personal history likewise was very good. This swelling began three months previously without any assignable cause, such, for example, as strain or injury, or as a sequel to gonorrhœa or syphilis. It progressed gradually, becoming noticeably bigger from week to week, incommoding the patient by its size, and alarming him by its growth, but in no way compromising his health, or preventing him from attending to business. Distinct pain was absent, but an uncomfortable or dragging sensation was complained of. The tumour presented all the characteristics of a hydrocele of the tunica vaginalis, being tense, pear-shaped, dull on percussion, fluctuating, prominent, extending from the bottom of the scrotum to the external abdominal ring, from which it could be easily isolated, and translucent to transmitted light. At his earnest solicitation I sterilised the scrotum, tapped the tumour, drew off a considerable quantity of deep straw-coloured fluid, which immediately and firmly clotted, sealed up the puncture with collodion, and strapped the scrotum. The strappings were removed in a week; there was no return of the hydrocele, the testis could be distinctly outlined, and there was no perceptible thickening of the tunica vaginalis or cord. Towards the close of autumn in the same year the patient returned, the tumour being as big as it was before. Again I tapped, but with a different result, the most marked features of which were that the tumour did not completely subside, the outline of the testis was indistinct, a distinct roughness of the tunica vaginalis was perceptible, and there was a permanent œdema of the lower part of the scrotum. When the tunica vaginalis was full again, in spring, 1899, the whole aspect of the tumour was



changed—the pear shape was maintained, and elasticity and fluctuation were still perceptible, but the scrotum was purplish in colour, œdematous, and marbled with blue distended veins, translucency had disappeared, and the cord felt thickened. I admitted the patient to hospital, and operated on him 12th April, 1899. On isolating and opening the tunica vaginalis I found it distended with a dark, yellowish brown fluid, and in part filled with a yellowish brown papillomatous growth, everywhere present on the visceral and parietal layers. I ligatured the cord high up, and shelled out the tumour and its coverings from the scrotum. The patient made an uninterrupted recovery, leaving his bed the tenth day after operation, and the hospital two days later. There was no rise of temperature or other untoward symptom. When I saw him last (in June) his health was in a satisfactory state, and no inconvenience from the site of operation was complained of.

Report on the histology of Mr. Fagan's case of tumour of the tunica vaginalis testis by E. J. McWeeney, M.D., &c.:—

“This tumour is a sort of villous papilloma, consisting of cubical cells of epithelial type, covering a complicated system of delicate papillary outgrowths springing from the deeper layer of the tunica. These outgrowths are of considerable length, and anastomose with each other so as to form a layer, in places half an inch thick, of soft papillated, fleshy neoplasm, covering the tunica vaginalis and encroaching on its cavity. The spaces between the anastomosing connective tissue branchlets are filled in with epithelial looking cells, which are sometimes wanting in the middle of the alveolus, so as to produce a close resemblance to tubules with central lumen. Every microscopic field is dotted over with mitoses, showing intense proliferative activity, and no one would suspect, on looking at the sections, that the growth could have originated elsewhere than in an epithelial structure. Its resemblance to villous papilloma of the urinary bladder is very striking; yet it originates from the endothelial lining of the tunica vaginalis, and is thus properly to be looked upon as an *endothelioma*.”

SOME RECENT X-RAY WORK.

By WILLIAM S. HAUGHTON, M.B.

[Read in the Section of Pathology, December 2, 1898.]

I HAVE once more to thank the Academy for their kindness in allowing me to bring forward a communication on Röntgen Photography. Since my last communication before the Academy on this subject, a good deal of very satisfactory work has been done, and many possibilities opened up, but it is only my intention this evening to briefly outline the more important recent successes of the process.

In my last paper before the Academy I divided the cases in which the process was applicable into three classes, according to the measure of success which might be expected in each class. Since then the process has proved its utility in so many additional conditions we must now considerably augment this list.

The following may be taken as fairly comprehensive :—

In First Class.

Surgery, under which we include—

1. Normal changes in bone.
2. Congenital and acquired deformities in bone.
3. Fractures.
4. Dislocations.
5. Epiphysary separations.
6. Diseases of bone.
7. To study results of operations in bone.
8. Location of foreign bodies.
9. In military surgery.
10. Calculi.

In the Second Class.

Dental Surgery, under which we include—

1. Normal eruption of teeth.
2. Abnormal eruption of teeth.
3. Caries.
4. Abscess.
5. Exostosis.
6. To study results of treatment.

In the Third Class.

Medicine, under which we include—

1. Changes in the heart and great vessels.
2. Pulmonary conditions.
3. Pleurisy with effusion.
4. Some of the changes in gout, rheumatism, syphilis, tuberculosis, rickets, osteomalacia, acromegaly and Charcot's disease.
5. To study effects of treatment.
6. Calculi in gall bladder, kidney, and urinary bladder.

In the Fourth Class.

Therapeutic action of the rays.

In the Fifth Class.

Pathological action of the rays.

In the Sixth.—Anatomy.

In the Seventh.—Physiology.

In the Eighth.—Obstetrics and gynaecology.

In the Ninth.—Medico-legal evidence.

In Surgery.—Here we have to study the normal changes in bone, and I have observed that young bones are very transparent, those of adults present a minimum opacity, while in old age increasing transparency is the rule—conditions intimately dependent on the amount of bone salts present, the transparency of age being doubtless due to senile decay

and atrophy—conditions familiar in intra-capsular fracture of the neck of the femur in the aged.

The relative transparency of soft tissues is also being carefully investigated, and up to the present the most accurate results I have seen are those of my friend Mr. Henly, who finds bone four times as opaque as fat, and muscle two and a half times. Characteristic changes also occur in the cancellous tissue at different ages—in the young a linear formation being the rule, highly suggestive of the histological structure of growing bone in the ossification of epiphyseal cartilages.

In *Congenital and Acquired Deformities of Bone*, conditions such as talipes and syndactylism may be examined in the living, bony deformities observed, and the necessary operation planned, whether it be tenotomy, osteotomy, or excision; while the many deformities due to *tight boots* may now be correctly examined and the treatment guided.

In *Fractures* splendid results have been obtained, and the frequency of certain unsuspected conditions determined, the process providing a ready and accurate diagnosis, and indicating prognosis and treatment while avoiding the shock of anæsthesia, besides useless and often dangerous manipulation; providing also an accurate record to protect the interests of the patient and surgeon, which is invaluable also for teaching purposes.

In my own experience I find that in Collis's fracture the ulnar styloid process is torn off in more than half the cases examined (61 per cent.)

"X-rays" have dealt the "bone-setter" a deadly blow, showing up his methods in a clear and unmistakable light; and, unless the public really wish to be "gulled" by this kind of "pirate," there is no reason why they should be so any longer, in the light of modern days!

To guide the treatment of *sequelæ in fractures* such as

false-joint, fibrous union, or fibrous ankylosis in joints, to plan the operation for "wiring," and to overhaul one's treatment in fractures, is now also rendered a much easier matter.

In *Dislocations*.—Here, too, applies all that has been said of fractures. But in both classes of injuries it is of the utmost importance to skiagraph a case very early—as soon after the injury as possible—as only on these conditions will the process furnish *grounds for exact* diagnosis, prognosis, and treatment.

My experience in "X-ray" work leads me to believe that many cases prove to be "simple dislocations" which are suspected of being either fractures or fractures complicating dislocation by epiphysary separations in the young.

Thus if the skiagraph be appealed to early in such cases, the correct treatment of an early reduction is suggested, and complete recovery will result.

In all such cases a "central skiagram" of the opposite limb is advisable, and, in addition, an extensive knowledge of the skiagraphic appearances of ossifying epiphyses in the young is indispensable for correct interpretation.

In *Epiphysary Separations* I need only refer you to Poland's splendid treatise on the subject, in which he pays a just tribute to the aid skiagraphy has been in the correct interpretation of the various injuries included under this head.

With regard to *Bone Disease*, it is only necessary to state that in most cases the extent of the disease may be correctly arrived at, and the necessary operation planned in such cases as tubercular disease, necrosis and new growth; such as osteomata, enchondromata, and osteo-sarcoma.

A good deal may also be done in the diagnosis of gout from chronic rheumatic arthritis.

In the localisation of *Foreign Bodies*, everyone is now

so familiar with this aspect of skiagraphy that I shall only mention one or two points.

In military surgery, as I have mentioned elsewhere, it has provided the operator with a probe which is *exact*, which is *painless*, which is *aseptic*. And in this connection I may mention that my friend and pupil, Major Battersby, of the R.A.M. Corps, has kindly furnished me with an extract from his experiences with the process recently in the Soudan, which I hope to have the pleasure of communicating to you when showing some of his skiagrams of the wounded after the battle of Omdurman.

Many excellent and accurate instruments for localisation have been devised, only two of which I shall mention—the Mackenzie-Davidson “localiser,” and Wm. M. Sweet’s “apparatus.” Both depend on the displacement of the tube producing two shadows of the foreign body, and by a simple process of triangulation results within a single mm. may be obtained.

With Sweet’s apparatus recently I located a grain of shot in the eyeball, getting the following measurements, *i.e.* :—

- 15 mms. - Behind centre of cornea.
- 7·5 „ - Below horizontal meridian.
- 2 „ - To nasal side of vertical meridian.

The tissues of the eye were, however, so lacerated and so much hæmorrhage was present that enucleation was almost a foregone conclusion.

In *Dental Surgery* the conditions of normal and abnormal eruption of teeth, caries, abscess, and exostosis, besides the result of certain treatment, may be observed with much speed and accuracy, as the skiagram negative can be developed in the dark room, and examined within twenty minutes after the photograph is taken.

In *Medicine* a good deal has been done, and more will soon be established. Changes in outline of the heart and thoracic

aorta, changes in the tissue of lungs and pleura, may be observed, besides some of the physical conditions in pleural and pericardial effusion and empyema.

In early *Phthisis* much information may often be obtained as to area of consolidation, and that, too, sometimes before bacilli appears in the sputum or physical signs reveal consolidation, as mentioned by Bouchard and other observers.

Patches of consolidation in the apex of either lung being shown as dark spots, and cavities as dark circles, with transparent centre, unless filled with pus, when they are dark all over.

In the treatment of cardiac disease where dilation or hypertrophy are present, the size of the heart may be watched from day to day, and measured if necessary, thus putting a gauge on the value of certain lines of treatment.

The observations on the effects on Bacteria are so conflicting I will not trouble you with them.

In connection with the *Pathological effects of the Rays*, we must admit that there is a certain but extremely small risk of dermatitis. Those who suffer most are X-ray workers themselves, from their frequent exposure. But very few cases are recorded where harm resulted except from ignorantly protracted exposures.

The dermatitis may affect the skin, hair, nails, and conjunctiva, causing, in some cases, shedding of hair and nails; but recovery is rapid when the cause is removed. Ulceration is extremely rare, and only follows exposures of an hour or more.

In *Anatomy and Physiology* the "X-rays" render some help. In the former, to study *anastomosis* and *ossification*, and in the latter, the movements of the heart and diaphragm.

In *Medico-legal Evidence* real benefit has accrued to both patient and surgeon, and I need only cite the following applications to convey an idea of the utility of the process:—

1. To prove the presence or absence of a *bone injury* or of a *foreign body* in criminal or civil cases.
2. In an action for malpractice.
3. For purposes of identification.
- 4 To prove the age of a foetus, and whether it had *breathed*.

In conclusion, allow me to convey to you my appreciation of the patience with which you have listened to my paper, which I fear has occupied your time too long.

NOTES ON SOME RECENT X-RAY WORK IN THE SOUDAN.

Major Battersby, who was recently in charge of the X-ray apparatus in the Soudan, regrets that a prior engagement prevents him being here to-night. He has kindly given me a short abstract of some of his work with the late Nile Expeditionary Force in the Soudan.

His headquarters were at Abadieh, a small village on the Nile, about 1,250 miles from Cairo, and 9 miles north of Berber. During the months of July, August, and September the shade temperature varied from 100 to 120° F., and severe dust storms were of almost daily or nightly occurrence, coupled with which no ice was procurable for the development of photograph plates. Consequently under such trying climatic conditions, both radiography and photography were carried out with great difficulty.

As a precautionary measure before leaving Cairo, Major Battersby had the boxes which contained his coils and batteries covered with thick felt, and by keeping this wet every two or three hours the trying journey through the desert was safely accomplished, and the insulation of coils preserved.

Photograph I. shows Nile at Abadieh, about $\frac{3}{4}$ of a mile broad.

II. Severe dust storm at 2 o'clock in the day.

III. Method of generating electricity by means of a small dynamo and tandem bicycle.

IV. Ten inch field service induction coil at work.

V. Modification of Mr. Mackenzie-Davidson's localising apparatus, specially made for Major Battersby and used by him for first time on field service in the Soudan.

By this method he was enabled successfully to localise with mathematical precision two large conical bullets which had entered in front near shoulder, and in each case were localised behind near shoulder blade. In another case the patient, who was also wounded at Omdurman, was hit 1 inch below and 1 inch behind the anterior superior spine of his left ilium. When examined at night the screen (with a lateral view) distinctly showed the bullet, which next day was accurately localised in pelvic cavity.

After the battle at Omdurman there were 121 British officers, non-commissioned officers and men wounded. Of this number there were 21 cases that could not be accurately diagnosed by ordinary surgical means. By the help of the Röntgen rays, which was used about sixty times, the bullet was either found or its absence demonstrated in 20 out of the 21 cases, the odd case being so ill with a severe bullet wound of lung, that it was not considered judicious at the time to examine him.

Skiagram I.—Bullet wound back of left hand. Metacarpal bone of middle finger injured, but no bullet present, consequently no probing resorted to. Illustrates case of spent bullet which had not lodged.

II. Bullet through outer and inner side of left arm, and a third wound near inferior angle of left scapula. Three pieces of bullet found at outer side of humerus; no bullet seen in chest, therefore no necessity to probe for it.

III. Skiagram taken through chest without removing dressings and bandages. Wound of entrance was near tip of

right shoulder behind the acromial end of clavicle. Front view revealed the bullet at right angles to axillary margin of scapula, about 2 inches below glenoid cavity. Outer tip of bullet just touching axillary border, probably in sub-scapular space. This case was localised by Mr. Mackenzie-Davidson's method and easily extracted.

IV. Bullet wound at inner part of left supra-orbital ridge. The projectile was supposed to be lodged at back of orbit, as the eyeball was protruding, and the sight destroyed. When studied closely the skiagram shows outlines of the bones of upper part of face, including orbital cavity, as well as fleshy parts of forehead and nose, but no trace of bullet. The eyeball was enucleated a few days afterwards, but no foreign body was found. Injury evidently produced by spent bullet, which drove a splinter of bone into the eye.

V. and VI. Bullet wound, left thigh. Front view shows bullet projecting from outer side of femur, about the middle of the shaft. Side view reveals projectile lying parallel with shaft on upper side.

VII. Shows the result of a bullet wound of left leg. The skiagram was taken some time after the injury, and shows clearly the fracture of both bones, the tibia especially being very severely damaged, and suffering from necrosis. Several splashes of lead are also seen in the wound.

VIII. Bullet wound, left ankle. Front view shows bullet with broad end towards inner side. Skiagram reveals bullet in joint between astragalus and scaphoid. Bands of lead plaster also visible. Bullet readily extracted.

DR. SCOTT considered the reducing to figures the comparative lengths of exposure of different tissues was very interesting.

DR. LANE JOYNT said that the question of causing dermatitis was most important. Recently some purely electrical experimenters had endeavoured to show that dermatitis is produced by any high electrical discharge quite independent of the X-ray tube. In the

Electrical Review some time ago reports showed that one might exceed about 500,000 volts, and get to 1,000,000 volts; that the risk of brush discharges in the neighbourhood was very great, and that dermatitis frequently followed, and could be produced at will by any X-ray tension or power. He thought that a good deal of false blame had been laid to the charge of the X-rays; he himself had never seen a case of dermatitis.

DR. E. J. McWEENEY said that he should be glad to know what effect caseous material had upon the rays, and what effect upon the rays calcification had? Again, what amount of opacity calculi of different kinds had? Was it possible to get shadows from those soft cholesterin and cholesterin pigmentary calculi found in the gall bladder? He had seen some X-ray photographs of tuberculous subjects in which the bones showed a remarkable amount of transparency, which might be due to the anatomical fact that the spaces in the cancellous tissue were larger than normal or to a smaller deposition of lime salts.

DR. MAUNSELL would like to know if in the skiagraphs of Potts' fracture Dr. Haughton had found that the astragalus was dislocated slightly backwards as well.

DR. KNOTT said that in cases of epiphysary disjunction the solution of continuity always ran through the bone near the cartilage.

DR. HAUGHTON, referring to Dr. McWeeney's remarks, said that he had been unable to obtain any good photographs of tubercular consolidation in the apex of the lungs owing to the movements of respiration. Caseous material was rather transparent, considerably more so than pus, the latter being nearly as opaque as water. In calcareous deposits very considerable opacity resulted, as the calcareous salt contained lime whose atomic weight is about 40, and the higher on the atomic scale the greater the opacity. Phosphatic calculi were rather transparent, oxalic were the most opaque, and uratic intermediate. Cholesterin was extremely transparent. Regarding the relative transparency of tubercular cases in comparison with normal, strumous subjects were often found with very transparent bones, probably due to a condition of malnutrition. There seemed to be possibly a smaller deposition of lime salts, perhaps associated with an enlargement of the cancellous tissue; but he himself thought the cancellous tissue presented a normal outline, while the transparency was greatly increased. In reply to Mr. Maunsell, he (Dr. Haughton) had not observed dislocation backwards in Potts' fracture.

SECTION OF STATE MEDICINE.

THE PREVALENCE OF TUBERCULOSIS IN IRELAND, AND THE MEASURES NECESSARY FOR ITS CONTROL.

By T. W. GRIMSHAW, C.B., M.A., M.D.;
Ex-President of the Royal College of Physicians in Ireland;
Registrar-General for Ireland.

[Read in the Section of State Medicine, February 17, 1899.]

So long ago as the 16th of April, 1885, in a paper entitled "Observations on the Relative Prevalence of Disease and Relative Death-rates in Town and Country Districts in Ireland," I called the attention of this Section of the Academy to the prevalence of phthisis in Ireland, and to its especial prevalence in Irish town districts. I do not propose here to repeat or bring up to date the considerable array of figures which I laid before the Academy on that occasion, but I wish to refer to their main result as it then stood, as shown by the following table for the ten years, 1871-80:—

LOCALITIES	Total Deaths		Principal Zymotics		Phthisis		Inflammatory Diseases of Respiratory Organs	
	No.	Rate per 1,000	No.	Rate per 1,000	No.	Rate per 1,000	No.	Rate per 1,000
Civic Districts	332,526	22·5	47,656	3·2	40,840	2·8	56,724	3·8
Rural Districts	634,219	16·6	67,391	1·8	62,688	1·6	86,267	2·3
Total Ireland	966,745	18·3	115,047	2·2	103,528	2·0	142,991	2·7

Remarking upon this table, I said:—

“It will be observed that these three groups comprise more than one-third of the mortality from all causes in Ireland, and that in each group the death-rate in towns far exceeds that of the average for Ireland, and of course still further that of the country districts. A further analysis shows that in the case of the principal zymoties the death-rate in towns exceeds that of the average of Ireland from the same causes by 10·6 per 10,000; in the case of phthisis, by 8·1; and in cases of diseases of the respiratory organs, by 11·4. The excess of mortality similarly taken in civic as compared with rural populations is—principal zymoties, 14·5; phthisis, 11·3; and diseases of the respiratory organs, 15·8.”

I also pointed out the difficulty of distinguishing, in statistical statements of causes of death, between phthisis and other forms of lung disease, many of the latter being mainly due to the previous affection of the respiratory organs by tubercular disease.

Again, on the 19th of May, 1887, I brought under the notice of this Section a paper “On the Prevalence and Distribution of Phthisis and other Forms of Disease of the Respiratory Organs in Ireland.” In the course of my remarks on that occasion I stated that “the total number of deaths registered in Ireland during the decade 1871-80 was 966,745. Of these, phthisis caused 103,528, or more than one-tenth. Other forms of disease of the respiratory organs, 142,991, or over one-seventh. The two groups taken together caused 246,519 deaths, or more than one-fourth of all the mortality of Ireland. It is, therefore, quite clear that in dealing with questions of the distribution and prevention of disease in Ireland by far the most important element to be taken into account is that of lung disease.”

At the Congress of the Sanitary Institute of Great Britain, held in Dublin in 1884 under the Presidency of the eminent sanitarian, Sir Robert Rawlinson, K.C.B., before either of the papers I have referred to was brought under the notice of this Academy, I had the honour of being appointed President of the Section of the Congress for "Sanitary Science and Preventive Medicine." On that occasion I chose as the title of my Address "The Statistical Measures of the Health of Communities," and said that—

"In estimating the value of death-rates as a test of healthiness, there are some elements to which too much importance appears to have been attached. It is too much the custom to attach exaggerated importance to the proportion of deaths from 'zymotic' diseases of an infectious or catching nature as evidence of unhealthiness. I admit that the prevalence of infectious diseases and their fatality is a very important element in estimating the health of a community; nevertheless, if the death-rate from any particular group of diseases were taken as a single test of unhealthiness, I should choose the constitutional, not the zymotic, group as the most reliable."

It will be observed that I on that occasion laid much greater stress on the prevalence of constitutional diseases as a test of the health of a community than on the prevalence of zymotic diseases, and of the former class of disease tuberculosis constitutes the great bulk.

Again, at the Congress of the Royal Sanitary Institute, held in Dublin in the autumn of last year, I had the honour of acting as President in the Section of "Preventive Medicine and Vital Statistics," and in my Address (entitled "The Relation between Preventive Medicine and Vital Statistics") I again called attention to the destructiveness of phthisis and other forms of tuberculosis in the following observations:—

"How is the death-toll levied? By what instrument does

the hand of Death inflict his wounds? By disease and accident. But by what disease is the death-toll raised to its highest? Many would answer, 'By epidemic and infectious diseases (zymotic as they are usually called), of course.' But this on inquiry is found not to be so. Ten diseases belonging to the class of zymotic diseases caused in the decade 1881-1890 only 70,717 deaths out of 883,156 in the whole of Ireland. This is about 8 per cent. out of the whole. Inflammatory diseases of the respiratory organs (bronchitis, pneumonia, &c.) caused in the same period 153,279 deaths, or more than double the number from the zymotic diseases alluded to. Consumption, or tuberculosis of the lungs, alone caused 103,314, or 11·7 per cent. of all the deaths, and if the other forms of tubercular disease be added the death-toll from tuberculosis will be so far raised as to make it as a single disease the most destructive of all maladies prevailing in Ireland, and exceeding in its destructiveness all the so-called infectious diseases put together. This is also generally true throughout Europe. There are other groups of diseases as destructive as the zymotic group, besides those which attack the respiratory system, but of these it is unnecessary for me to give details. The disease, however, as a malady which is the most destructive is tuberculosis. This has now been distinctly ascertained to be of an infectious character. Many of its modes of propagation are well known, and it is the one above all others to be dealt with by sanitarians. It used to be the custom to speak of the infective fevers as *par excellence* the preventable diseases, and to these the sanitarian has mainly directed his attention. This attention should not in the least be relaxed, and the diminution in the death-rate from infectious fevers is in itself a demonstration of what sanitarians can accomplish. It is now their duty to follow up tuberculosis, and it is equally certain the result will repay the effort."

In the "Manual of Public Health for Ireland," published in 1875, of which I was one of the joint authors with Dr. Emerson Reynolds (now Professor of Chemistry in the University of Dublin), Mr. R. O'Brien Furlong (now Chairman of the Board of the National Hospital for Consumption), and Dr. J. W. Moore (the present President of the Royal College of Physicians, Ireland), in a chapter headed "Diseases usually called Constitutional which are Caused or Promoted by General Unhealthy Conditions," in discussing the question of "Scrofulous Affections," we state—

"It would not be advisable, in the present state of our pathological knowledge, to treat scrofula and tuberculosis as synonymous terms; but even admitting that in many cases the diseases may be far removed from one another, yet, from a sanitary point of view, they must be looked upon as having a close relationship.

"*Phthisis*.—By far the most important disease of this class is phthisis or pulmonary consumption, which is much more under the control of sanitary measures than is generally believed by the public."

We then point to remedies, and insist on healthy surroundings, dry sites for dwelling-places, &c., and refer to the works of Dr. Henry MacCormac of Belfast (father of Sir William MacCormac, Bart., K.C.V.O., the eminent President of the Royal College of Surgeons of England), and his persistent advocacy of the free use of fresh air as the most important element in the prevention and cure of consumption—a disease which Dr. MacCormac attributed to the inhaling of air which had already been used for human respiration. Dr. MacCormac wrote before the days of Koch's great discovery. Our "Manual of Public Health" was written when the tubercular bacillus was unknown. We were not alone in insisting on the great importance of the prevention of phthisis, and in advocating the adoption of

many of the means ascertained to tend to that end. The public, however, were disinclined to listen, and indulged in the fatalistic view that consumption was a hereditary, incurable and non-preventable disease.

I have thus for over twenty years been calling attention to this subject. I have also in my official reports, especially in my decennial summaries of marriages, births and deaths for the decades 1871-80 and 1881-90, called attention to the same subject, but I am sorry to say with but little effect. I know that in this matter I have the full support of all my professional brethren throughout Ireland. I know that they all agree with me, and admit the terrible gravity of the case I have put before them; but even if they had all spoken out their minds I am afraid they would have made but little impression on the public. I believe, however, the public are now beginning to see the gravity of the danger and to appreciate—at present I admit but slightly—the enormous loss and misery inflicted upon the community by tuberculosis.

The Reports of the Royal Commissions on Tuberculosis which have sat during the past few years have done much to form an educated public opinion on this subject.

The Royal Commission of 1890, which was renewed in 1894 and reported in 1895, was appointed to inquire into "The Effect of Food derived from Tuberculous Animals on Human Health."

A further Royal Commission issued in 1896, which reported in 1898, was appointed to inquire into administrative procedures for controlling danger to man through the use as food of the meat and milk of tuberculous animals.

The Reports of these two Commissions prove conclusively the dangers which exist of communicating tubercle from the lower animals to man through the medium of meat and milk, and suggest many remedial measures.

The inquiries made by the Royal Commission of 1890-94 have brought prominently before the public many facts which were previously only known to scientists, medical men, and veterinaries. The public are now becoming alive to the fact that much of the tubercular disease—especially *tuberculosis mesenterica* and tubercular meningitis, which mainly affect children—must be to a great extent due to the tubercular bacillus introduced through the milk which forms so large a portion of the food of our little ones. In the Report of the Royal Commission of 1890-94, Dr. Sidney Martin (who was specially employed with other experts to make scientific investigations for the Commission) states that “the milk of cows with tuberculosis of the udder possesses a virulence which can only be described as extraordinary. All the animals inoculated showed tuberculosis in its most rapid form.”

Regarding the presence of tuberculosis in the organs of slaughtered animals the following is an extract from the Report of the Royal Commission of 1890-94:—

“Thus, from the excellent records of the Copenhagen slaughter-houses, the following totals for the four years 1890-3 inclusive have been derived:—

“Of 132,294 oxen and cows, 23,305 showed evidence of tubercle.

“Of 8,292 swine, 1,272 showed evidences of tubercle.

“Of 185,765 calves, 369 showed evidences of tubercle.

“Of 337,014 sheep, one only showed evidences of tubercle.

“And the animals range themselves, at the time they are presented to the butcher, in the above order according to the frequency of tuberculosis in each, the percentage of tuberculous animals being here 17·7 for oxen and cows, 15·3 for swine, 0·2 for calves, and 0·0003 only among sheep.

“From the Berlin slaughter-houses, the following is the report for the year 1892-3:—

"Of 142,874 oxen and cows, 21,603 showed evidences of tuberculosis, and 1,609 were condemned on this account.

"Of 518,073 swine, 7,055 showed evidences of tuberculosis, and 1,191 were condemned on this account.

"Of 108,348 calves, 125 showed evidences of tuberculosis, and 62 were condemned on this account.

"Of 355,949 sheep, 15 showed evidences of tuberculosis, and 12 were condemned on this account.

"The percentages of tuberculous animals, therefore, were, at Berlin slaughter-houses, 15.1 for oxen and cows, 1.55 for swine, 0.11 for calves, and 0.004 only for sheep; and the percentages of the several kinds of animals condemned on account of tuberculosis were—for cows and oxen 1.26; for swine, 0.23; for calves, 0.06; and for sheep, 0.003.

"There do not exist for the United Kingdom any records with which these can be compared. At Copenhagen and Berlin all the meat furnished to the towns is submitted to the inspection of experts. But we have reason to think that the facts about tuberculous animals would exhibit a broad resemblance to the foregoing, if such records could be obtained; not more different in degree, that is, than the difference seen between the Copenhagen and Berlin records, or than would be explained by variations in the practice of dealing with food-animals in one and another country. Such few data as are to be had for the United Kingdom confirm this view. Three hundred milch cows had to be slaughtered in Edinburgh in 1890 on account of the appearance of epidemic pleuro-pneumonia there, and their carcasses were examined as to the presence or absence of tuberculous matter in them. Of the three hundred, 120, or 40 per cent., were found to be tuberculous the percentage varying between 12 and 83, according as they came from one or another cowhouse. In Edinburgh, again, out of 27,769 cattle

brought for slaughter to the public abattoir in 1890, 179, or 0·65 per cent., were condemned as being tuberculous, this percentage having risen from 0·16 in 1887, when the system of examining for tubercle was begun there. Five pigs were condemned in 1890 out of 4,973, and no calves out of 5,160; no record is given about sheep.^a

I need scarcely say that the thoughtful members of the public who became acquainted with these facts through the public press—for few read blue books—began to take alarm.

About this time—in August, 1896—Dr. J. W. Moore, the present President of the Royal College of Physicians of Ireland, and of the Medical Section of the Academy, brought the subject of tuberculosis under the notice of the meeting of the British Medical Association at Carlisle (mainly from the human point of view) in an able paper read before the Medical Section at that meeting. Other important papers bearing upon the communication of the disease through food and on the methods of prevention were brought under the notice of the Preventive Medicine Section of the meeting.

After the reading of Dr. Moore's paper, I had the honour of proposing the following resolution, which was seconded by Sir William Gairdner:—

“1. That provision should be made at the public expense for bacteriological laboratories by all Sanitary Authorities, where the sputum of patients suspected to be suffering from tuberculous disease may be examined and reported upon; and

“2. That on the discovery of pulmonary phthisis in any individual of the poorer classes, public provision should be made for the treatment of such case in a public institution provided for the purpose at the public expense, or by voluntary contributions.”

^a The total number of the animals *observed to be tuberculous* is not recorded. The above figures from the Edinburgh abattoir relate to animals *condemned* on that account.

This resolution was unanimously adopted by the Association at its General Meeting.

After some delay the resolution was dealt with by a Committee of the Association, whose Report will be found in the pages of the *British Medical Journal* for the 28th of January, 1899, and thus the subject has been placed before the Medical Profession of the United Kingdom in an authoritative manner.

While this matter was under the consideration of the British Medical Association, an important step was taken by the Presidents of the Royal Colleges in London, in conjunction with Sir William Broadbent. These eminent medical men inaugurated a movement for providing a National Society for the Prevention of Phthisis and other forms of Tuberculosis, and wrote a letter to the newspapers which appeared in almost every daily journal in the United Kingdom, calling for public support for the Society they had established, and announcing that His Royal Highness the Prince of Wales approved of the movement.

His Royal Highness further showed his appreciation of the movement by inviting a number of persons interested in the subject to meet him with the present and late Prime Ministers at Marlborough House, to further discuss the question and place the Society on a permanent footing. Ireland was represented at that meeting by the President of the Royal College of Physicians; Mr. Furlong, Chairman of the Board of the National Hospital for Consumption; and myself.

The meeting was held on the 20th of December of last year.

The question of the prevention of tuberculosis has thus been placed on a most extended and popular basis, and our profession has at last an opportunity of impressing our views on the general public with some prospect of success.

I shall now proceed to point out the amount of injury

this disease inflicts on the community, and the measures which may be taken for the mitigation of the evil.

It is estimated that about 1,000,000 deaths are annually caused by tuberculosis in Europe.

If we take the three principal forms of tuberculosis, viz.:—tabes mesenterica, tubercular meningitis, and phthisis pulmonalis, we find that in the United Kingdom the average annual deaths for the five years 1892–96 were—tabes mesenterica 8,659, tubercular meningitis 8,707, phthisis 59,015, making a total of 76,381, which is equivalent to 10·8 per cent. of the deaths from all causes. In this calculation other forms of tuberculosis are excluded, such as tubercular diseases of glands, joints, bones, scrofulous abscess, &c.; this latter group is not so fatal as the principal forms, but in numberless cases where not fatal the disease maims for life. Taking Ireland separately as more nearly concerning us, for the five years already referred to, we find that the average deaths were—from tabes mesenterica 954, tubercular meningitis 928, phthisis 9,672, making a total of 11,554, and constituting 13·9 per cent. of all the deaths in Ireland.

For our own Dublin District the corresponding figures were—tabes mesenterica 229, tubercular meningitis 161, phthisis 1,214, making a total of 1,604, which is equivalent to no less than 17·2 per cent. of all the deaths in Dublin and its suburbs.

It is interesting to contrast the number of deaths from all forms of tubercular disease with the number from the principal zymotic or acute specific diseases.

The following statement shows for each of the three portions of the United Kingdom, and for the whole area, the annual mortality from tuberculosis and from acute specific diseases per million living, at all ages, and in each of the first three quinquennial periods of life, during the decennium 1881-90:—

				Ages			
				0-5	5-10	10-15	All Ages
(a) Acute Specific Diseases	England and Wales	...	9,130	1,839	541	1,667	
	Ireland	...	5,595	1,444	588	1,131	
	Scotland	...	9,764	1,858	591	1,774	
	United Kingdom	...	8,795	1,788	552	1,606	
(b) Tuberculosis	England and Wales	...	4,499	844	827	2,420	
	Ireland	...	3,326	1,184	1,491	2,665	
	Scotland	...	4,368	1,520	1,506	2,743	
	United Kingdom	...	4,351	962	995	2,488	

Evidently it is more important to bring the tubercular class of disease under control than the zymotic.

It will be observed in the foregoing statement that, in Ireland, deaths from tubercular diseases more than double the number caused by those diseases of the zymotic form, to the prevention of which sanitary measures have been mainly directed.

Dr. J. W. Moore has shown in his Carlisle paper that during many years past tubercular diseases—especially those of the more fatal forms—have shown a tendency to diminish; this diminution has been best marked in England, less marked in Scotland, and scarcely, if at all, in Ireland. No doubt this decrease is mainly due to improved general sanitation, not to special efforts to control the disease itself.

I regret to have to emphasise the very unwelcome fact that phthisis has shown a tendency to increase in Ireland.

In the decade 1871-80, phthisis caused 10·7 per cent. of all the deaths in Ireland, and the rate of mortality was 19·6 per 10,000 living. In the next decade, the percentage

rose to 11·7, and the rate to 20·9 per 10,000. Taking an average of 25 years we find, according to the returns issued by my office, that the deaths caused by tabes mesenterica, tubercular meningitis and phthisis pulmonalis, amounted to an annual average of 13,304, out of an average total number of deaths from all causes for Ireland of 91,067; thus the deaths from these three forms of tubercular disease caused 14·6 per cent. of all the deaths in Ireland during 25 years.

In the paper to which I have already referred, regarding the contrast between town and country districts in Ireland, I emphasised the fact that the mortality from phthisis was much greater in those districts containing towns than in purely rural districts.

In my Address to the Sanitary Congress in Dublin I mentioned, among other matters, that, roughly, the eight Western Counties of Ireland might (as they contain few large towns) be taken as healthy death-rate districts, the remaining districts being taken as less healthy death-rate districts. The death-rate for the former was only 14, that of the latter 19·1 per 1,000 for the decade 1881-90.

If we take all the districts containing towns with populations of 10,000 and upwards, and those not containing any considerable town populations, we find the respective death-rates for the same decade were—for the former 22·3, for the latter 16·0, as compared with a rate for Ireland of 17·0.

If we consider the death-rates of Irish towns as compared with those of towns in England, we find that they are inordinately high.

Now, we know that this high death-rate is not caused by infantile mortality, nor is it among the very old, therefore we must conclude that it is at what ought to be the healthy ages that the excess is to be found.

In order to test this question it first became necessary to analyse the age population of our towns, and compare it with the rural; the result is shown in the following table:—

IRELAND.—Number of Persons at each Age Period in every 100 at all Ages.—Census of 1891.

—	Under 1 year	1 and under 5	5 and under 10	10 and under 15	15 and under 20	20 and under 25	25 and under 30	30 and under 35	35 and under 40	40 and under 45	45 and under 50	50 and under 55	55 and under 60	60 and under 65	65 and under 70	70 and under 75	75 and under 80	80 and under 85	85 and under 90	90 and under 95	95 and under 100	100 and up- wards	Ages not speci- fied
Rate per Cent. for —																							
6 Principal Towns	2.4	8.6	10.1	9.3	10.8	11.1	9.1	7.5	5.9	6.1	4.6	4.8	2.6	2.9	1.4	1.3	0.5	0.3	0.1	0.0	0.0	0.0	0.1
23 Towns	-	2.1	8.6	10.2	10.0	11.0	8.8	7.3	5.8	6.0	4.6	4.8	2.6	3.0	1.4	1.3	0.6	0.4	0.1	0.0	0.0	0.0	0.1
ALL IRELAND	-	1.9	8.1	10.8	11.7	9.3	6.8	5.9	4.9	5.5	4.3	5.4	3.0	4.1	1.9	2.2	1.0	0.9	0.3	0.1	0.0	0.0	0.0
The 17 Larger Towns	2.2	8.6	10.7	10.7	11.9	10.5	7.6	6.4	5.4	5.6	4.3	5.0	2.8	3.6	1.7	1.6	0.7	0.5	0.1	0.1	0.0	0.0	0.0
Rural Districts* -	1.8	7.9	11.0	12.1	11.9	9.1	6.3	5.6	4.6	5.4	4.3	5.6	3.1	4.3	2.0	2.4	1.1	1.1	0.3	0.1	0.0	0.0	0.0

* Ireland, exclusive of 23 Towns.

From this table it will be seen that the proportion of the population under 5 years of age is in excess in town as compared with country districts; between the ages 10 to 15 it is less in town than in country; from the ages 20 to 45—that is, during the period of active working life—the proportion is greater in town than in country; beyond the age of 45—that is, after middle life—the proportion is greater in the country than in the town districts.

Phthisis is particularly prevalent among young adults, and it has been ascertained that about one-half of all the deaths in the United Kingdom between the ages of 25 and 35 are caused by phthisis.

In Ireland we find that for the decade 1881-90, of 55,912 deaths between these ages, 25,495, or 45·6 per cent., were caused by phthisis. *Tabes mesenterica* and tubercular meningitis are mainly fatal among children under 5 years of age. The former caused 8,236 deaths of children under 5 years of age, the latter 5,596, making 13,832 out of a total of 188,332, or 7·3 per cent. of all deaths at that age, during the decade in Ireland. We thus find that about 1 in 13 of all the deaths of young children in Ireland are caused by these two forms of tuberculosis. It must be remembered that the less-defined forms of tuberculosis, commonly denominated *scrofula*, are omitted from these calculations. It is not, however, surprising that when we find that a considerable number of those between the ages of 25 and 35, who must constitute a large number of the parents of these children, are affected by phthisis, that many of their offspring should suffer from other forms of tuberculosis, besides the risks the children run from that virulent vehicle of tuberculosis, infected milk.

I shall now proceed to analyse the statistics of deaths from tuberculosis in Ireland during recent years, distinguishing the deaths in those Registrars' Districts containing

towns with a population of 10,000 and upwards from deaths in rural districts, and also dealing with the mortality from tuberculosis at the principal age periods. In order to eliminate disturbing causes I have selected the statistics of the last three years for which detailed statistics are available—viz., 1895, 1896 and 1897. I include districts with towns having a less population than 10,000, with the country districts, because in many towns with comparatively small populations there are situated Union Workhouses which contain many persons not belonging to the Registrar's District whose deaths would tend materially to increase the death-rates of those towns. This presence of workhouses does not appreciably affect the three principal town districts—viz., Dublin (including its suburban townships), Belfast and Cork—nor does it materially affect other districts including towns with populations of 20,000 and upwards. I have set out in the accompanying table all the main features regarding general death-rates, death-rates at the principal age periods from tuberculosis, and the proportion of deaths from tuberculosis to deaths from all causes. I have purposely avoided going into too minute details in this table, in order that the paper may not be incumbered with statistics. The rates are based on the Census population of 1891. The facts shown in this table are sufficiently serious and certainly call for the most earnest attention of all who are interested in the prevention of disease.

An examination of the table shows that during the three years dealt with—1895, 1896 and 1897—the average annual death-rate for Ireland was 17·3 per 1,000, the rate for the town districts (that is towns with a population of 10,000 and upwards) was 25·4, and for the rest of Ireland 15·2.

Average Annual Mortality during the three years 1895-97 in all Ireland, and in those Registrars' Districts containing the Larger Towns, from (1) All Causes, (2) Tabes Mesenterica, Tubercular Meningitis, Scrophula, and Tubercularis ill-defined, (3) Phthisis; at All Ages and at certain Selected Ages.

AVERAGE ANNUAL RESULTS FOR THE THREE YEARS 1895, 1896, AND 1897															
Localities	Population in 1891	Death-rate per 1,000 of Population at all ages yielded by deaths from			Rate per 1,000 of Population at same age represented by Deaths under 5 years of age from			Deaths at the ages 15 and under 45 from			Percentage of the Deaths from All Causes at the same age caused by Phthisis				
		All Causes	Tabes Mesenterica, Tubercular Meningitis, and Tuberculosis ill-defined	Phthisis	All Causes	Tabes Mesenterica, Tubercular Meningitis, and Tuberculosis ill-defined	All Causes	Phthisis	Ages						
									15 and under 45	15 and under 25	25 and under 35	35 and under 45	All Ages		
Districts containing Towns of 20,000 or more Inhabitants:—															
Dublin Registration Area -	349,594	27.2	1.8	3.3	83.3	11.0	12.4	0.5	4.6	37.5	42.8	44.6	41.4	29.0	12.0
Belfast, Nos. 1-6 & 9-11, & } Castlereagh, Nos. 1 & 4 }	266,185	27.6	1.8	3.9	88.5	10.0	13.9	0.4	6.1	43.8	49.8	55.4	44.1	29.9	14.2
Cork—Nos. 1-9 - - - - -	89,785	23.8	1.1	3.8	59.0	6.2	12.3	0.4	5.9	48.3	53.7	54.4	53.1	37.3	15.9
Limerick—Nos. 1-4 - - - -	41,828	21.1	0.7	3.0	45.2	3.3	10.4	0.1	5.1	49.0	53.6	56.3	51.5	40.2	14.5
Londonderry—Nos. 1 & 2 } and Glendernot - - - - }	40,090	22.5	1.6	2.5	58.1	6.6	10.5	0.8	4.2	39.6	46.6	52.5	38.5	25.5	11.3
Waterford—Nos. 1 & 2 - - -	28,893	22.3	1.2	3.2	51.6	6.7	10.9	0.3	5.2	48.1	57.1	58.6	55.2	25.4	14.3
Total of above - - - - -	816,375	26.2	1.6	3.5	78.3	9.4	12.6	0.4	5.3	41.8	47.7	51.4	44.3	30.3	13.3
Districts—towns of 10,000 } or more inhabitants }	962,513	25.4	1.5	3.3	73.5	8.7	12.2	0.4	5.1	42.0	48.0	51.9	44.2	30.1	13.2
Remainder of Ireland - - -	3,742,937	15.2	0.4	1.7	26.2	2.0	6.7	0.2	3.0	44.3	50.4	53.2	47.2	28.5	11.1
All Ireland - - - - -	4,704,751	17.3	0.7	2.0	36.8	3.5	7.9	0.3	3.5	43.5	49.6	52.8	46.1	29.1	11.7

For Ireland the death-rate from all tubercular diseases, exclusive of phthisis, was 0·7 per 1,000; for country districts 0·4; for town districts 1·5, or nearly four times the latter rate. For consumption alone the rates were—for Ireland 2·0; for country districts, 1·7; for town districts, 3·3, or nearly double the latter rate. Taking all forms of tubercular disease the rate for Ireland was 2·7, for country districts the rate was 2·1, for town districts 4·8, or more than double.

In the districts with the six large towns the rates were from all causes 26·2, as compared with 15·2 in country districts, from tuberculosis other than phthisis 1·6, against 0·4, or exactly four times the rate; for phthisis 3·5 against 1·7, or slightly more than double the rate; and for all forms of tuberculosis combined 5·1, against 2·1, or considerably more than double as compared with country districts.

It will be observed that by far the most important cause of death dealt with in the foregoing remarks is phthisis. This disease alone caused 11·7 per cent. of all the deaths in Ireland during the period under consideration, the percentage for the districts with towns of over 20,000 population being 13·3, for those with towns of 10,000 inhabitants and upwards 13·2, or slightly less, as compared with 11·1 per cent. for the rest of Ireland. These figures point to a conclusion which to many will be somewhat unexpected—namely, that the proportion of deaths from consumption to total deaths is very high even in the country districts of Ireland.

Of course the people in towns have to contend against many other dangers to life, which I have referred to in the papers I have already quoted. This, however, is beside the question I have at present to deal with.

If we compare the death-rates from tubercular disease in the six large town districts of Ireland as measured by the general population, we find that, as regards the mortality

from the forms of tuberculosis other than phthisis, Dublin and Belfast are the same, 1·8 per 1,000; Londonderry next, 1·6; Waterford, 1·2; Cork, 1·1; and Limerick, 0·7 only. In the case of phthisis we find Belfast leads with a rate of 3·9; Cork follows with 3·8; then in order, Dublin, 3·3; Waterford, 3·2; Limerick, 3·0; Londonderry, 2·5.

The figures I have quoted are sufficiently serious, but when we consider the question of the ages at which these tuberculous diseases are most fatal we find still more alarming results. In the case of death-rates there may be some errors owing to unestimated variations in population since the last Census, but when we consider the deaths from tuberculosis in relation to those from all causes, this element of doubt has little or no significance.

I shall first deal with the question of tuberculosis as it affects young children—by this I mean children under 5 years of age. It has been shown by Sir Richard Thorne,^a and by the Report of the British Medical Association, that the tendency to the decrease of tuberculosis among young children in England and Wales is not so marked as it is in the case of phthisis; this is one element of importance. Another point of importance is that the prevalence of tuberculosis among young children is attributed, and no doubt correctly, to the fact that milk constitutes a large portion of their food. The forms of tuberculosis which kill young

^a The mortality from tuberculosis in early childhood is not decreasing ■ it is at other ages in the United Kingdom, and the opinion that this great prevalence of the disease in infancy and childhood is due to infection through the alimentary canal by milk from tuberculous cows appears to be well founded. The following table, showing the mean death-rates from *tuberculosis mesenterica* in England and Wales among infants under one year of age per million living, is given by Sir Richard Thorne in his second Harben Lecture :—

1851-60	.....	3,160	.....	1881-85	.....	4,356
1861-70	.....	3,800	.....	1886-90	.....	4,462
1871-80	.....	4,467	.....	1891-95	.....	4,046

(Report of British Medical Association, *British Medical Journal*,
28th January, 1899.)

children are *tabes mesenterica*, tubercular meningitis, and forms of tubercle other than pulmonary consumption. We find that in Ireland the death-rate of children under 5 years of age from these forms of tuberculosis was 3·5 per 1,000 living at this age period. In the districts with towns of 10,000 and upwards the rate was 8·7, as compared with 2·0 in country districts, or more than four times the rate; in the six large towns taken collectively it rises to 9·4—in Dublin it reaches 11·0, and in Belfast 10·0; in the others it is considerably below the 10,000 towns rate, the rate for Limerick being only 3·3, or less than the average rate for Ireland. The very high proportion of deaths in Dublin and Belfast is very remarkable and very serious.

If we now pass to the more active periods of life, and consider the deaths from tuberculosis between the ages of 15 and 45, the main working period of life, we find that in Ireland during these ages the death-rate from tuberculosis of all kinds was 3·8 per 1,000 living at these ages (out of a total rate of 7·9 from all causes, being nearly one-half) of which the phthisis rate was 3·5. In the districts with towns of 10,000 and upwards the rate was 5·5 out of a total rate of 12·2, of which the phthisis rate was 5·1. In the six large towns the rate was 5·7 out of a total rate of 12·6, phthisis having a rate of 5·3. It will be observed in the foregoing statement the death-rate from phthisis dominates the whole series of figures, and therefore we may confine our attention in detail to the proportion of deaths from that form of tuberculous disease, and here I shall deal only with the proportion of deaths from phthisis to the total number of deaths, as showing in the clearest manner the immense amount of damage done by phthisis at the most active periods of life in Ireland.

It will be observed that by aid of the latter columns of the table the number of deaths from phthisis in every 100

deaths from all causes at certain age periods—viz., 15-35, 15-25, 25-35, and 35-45—can be compared with the total deaths from phthisis at the ages 15-45.

I am bound to say that the results exhibited in this table have taken me somewhat by surprise, for they show that the proportion of the people of the adolescent and the active adult ages who die of pulmonary consumption in the country districts of Ireland surpasses my worst anticipations.

An examination of the table shows that at all the age periods from 15 to 45, except that between 35 and 45, the proportion of deaths from phthisis to total deaths in the country districts exceeds that in the town districts (those having towns with populations of 10,000 and upwards) when taken collectively, and that this is also true of the country districts when compared with the districts having towns with a population of 20,000 and upwards.

Taking Ireland as a whole we find that during the whole age period of 15 to 45 the deaths from phthisis constituted 43·5 per cent.; in the period from 15 to 35, 49·6 per cent., or nearly one-half; in that from 15 to 25—which is apparently the most fatal 10 year period—52·8 per cent., or more than one-half; from 25 to 35, 46·1 per cent.; and from 35 to 45, 29·1 per cent., compared with a total for all ages of 11·7 per cent. of the total deaths.

I do not think it necessary to analyse all the figures in these columns, but it is important to emphasise the fact that in Ireland the age at which phthisis causes the greatest proportion of the total mortality is the period from 15 to 25, and to point out that the percentage of deaths to total deaths during this period reaches the terrible total of 44·6 per cent. in Dublin, 55·4 per cent. in Belfast, 54·4 per cent. in Cork, 56·3 per cent. in Limerick, 52·5 per cent. in Londonderry, and no less than 58·6 per cent. in Waterford.

In the next decade of life, 25 to 35, the percentages fall somewhat in each case, but are still so near one-half of all the deaths at that age as to excite considerable alarm as to the ultimate result to what ought to be the most active portion of the community.

I would again point out that this table is founded on the most recent information available at the present time.

The methods by which tuberculosis spreads are now sufficiently well known, and have already been indicated in this paper. They may be classed under two heads:—

1. From man to man by the expectoration from phthisical patients, by discharges from the bowels and sores of persons suffering from other forms of tuberculosis.

2. From animals to man—

- (a). Through the consumption of tuberculous milk (especially from cows with diseased udders) and meat.

- (b). By discharges from animals affected by tuberculosis.

With reference to the limiting of the spread of tuberculosis from human sources, I would first insist on general sanitary measures—cleanliness of every kind, the letting in of air and light into crowded neighbourhoods in large towns, the securing of ample cubic space (not the mere 300 or 400 cubic feet which now seems to satisfy sanitary authorities), ventilation and sunlight in dwellings.

The next is to cut off and destroy the contagious material itself. This may be done by isolation of affected persons, and the destruction of all material which may be a vehicle for the conveyance of the tubercular bacillus.

The general proposal of isolation of infected persons must not be taken in the sense that is conveyed when isolation of cases of “dangerous infective diseases” is spoken of. In

many cases it does not even mean separation of the sufferers from their own home-surroundings. In the cases of those who are provided with ample house accommodation and access to plenty of fresh air by efficient ventilation, open windows, and a large proportion of time spent in the open air, isolation need rarely be carried beyond the interdicting of sleeping in the same rooms, and especially in the same beds, of the infected and non-infected. With such persons the main precautions consist in the destruction of all discharges from the infected persons—in the case of phthisis the expectoration should be carefully collected in suitable receptacles charged with disinfectants, and destroyed—the dispensing with all appliances, such as upholstered furniture and hangings, which tend to accumulate dust which may possibly harbour the tubercular bacillus in its dried form; and the careful disinfecting of all clothing, handkerchiefs, towels, &c., used by the infected persons.

In the case of those with but small house accommodation, or the dwellers in cottages and tenement houses where the requirements I have just alluded to cannot be fulfilled, it appears to me that hospital isolation is the only method for providing the necessary conditions of safety for the healthy, and chance of cure or improvement for the sick. Such hospital accommodation should be provided for, in the case of those who can pay, in paying sanatoria of the home hospital character; for the artisan and labouring classes (as at present for other diseases) by voluntary charities, and in the case of the very poor at the expense of the rates. The method of provision for the two former classes seems obvious and has been already adopted to some small extent. In the last case, which was dealt with by the second paragraph of the Carlisle resolution—viz., the poorer class—this is not so obvious. It would be unreasonable to expect, and I believe, in the vast majority of instances, inadvisable for, Sanitary

Authorities or Poor Law Guardians to provide special hospitals for the isolation and treatment of consumption. In very many cases the authority would be unable to find within or near its own district a place suitable as to site and surroundings for such an institution.

I believe it will be found that the best method of providing for poor persons affected by tuberculosis would be the payment by the local authorities for the treatment of the patients of their district in specially-arranged voluntary hospitals.

This plan would, I believe, be the cheapest and also the pleasantest for the affected persons. There seems to be no doubt that in England and Ireland the power to do this is possessed by Sanitary Authorities and Poor Law Guardians. In Scotland I am afraid this is not so. The details necessary for the carrying out of these suggestions would require long and very careful consideration, which it would be out of place to enter upon here. In all cases admitted to hospital the houses or rooms in which the patients have resided should be thoroughly cleansed and disinfected, so as to destroy all traces of the fatal bacillus. It is clear that this duty of cleansing and disinfecting houses must be discharged by the Sanitary Authority.

The next important question is how is the Sanitary Authority to become aware of the existence of cases of tuberculosis? This at once raises the question—Is tuberculosis to be a compulsorily notifiable disease? To the latter question I answer in the negative, and I believe the bulk of the medical profession and nearly the whole of the public will agree with me.

I consider tuberculosis so widely diffused that if an inquiry were made into every doubtful case the number of cases discovered would be so great that a very large proportion of the population would be notified as sufferers, the Sanitary Authorities would be overpowered with the work of

dealing with this particular disease, and the public would so resent the interference that the attempt would be a gigantic failure. I, therefore, think compulsory notification of tuberculosis impracticable, and that it should not be attempted.

I consider, however, that all cases of death from phthisis, cases of removal to hospital, and all cases which may come to the knowledge of public medical officers, should be brought under the notice of the Sanitary Authorities.

How are the medical attendants of the sick, either poor or rich, to be absolutely certain that they are dealing with cases of tuberculosis, so as to give the necessary warning of danger to the patients and their friends, and thus enable them or the Sanitary Authorities to take the steps I have indicated to prevent the spread of the disease?

The answer to this is to be found in the first part of the Carlisle resolution which I have already quoted—viz., the provision of bacteriological laboratories by Sanitary Authorities. This may be done in a manner similar to that suggested for hospitals—that is, let Sanitary Authorities have recourse to the laboratories provided in great centres or at special hospitals, paying only for the use they make of them, but let the use of these laboratories be free to all medical men requiring sputum, &c., to be examined. Many such laboratories now exist and could at once be utilised.

It would be out of place here to discuss the treatment of tuberculosis, but it is now well known that phthisis and other forms of tubercular disease are curable, and the success which has attended the treatment of phthisis by fresh air, and, as far as practicable, open air, proves that no time should be lost in extending the accommodation for the treatment of phthisis which already exists, and adding new hospitals where they may be required.

The question of the prevention of the infection of human beings through the agency of food has, as I have already

mentioned, been considered by the Royal Commission of 1896, which reported so lately as April, 1898. Thus the latest and most authoritative information is available on this point. I consider I cannot do better than quote the principal portions of the recommendations of the Commission as indicating the necessary measures of prevention in this direction.

Regarding Slaughter-houses the Commissioners recommend:—

1. That in all towns and municipal boroughs in England and Wales, and in Ireland, powers be conferred on the authorities similar to those conferred in Scotland:—

(a.) When the local authority in any town or urban district in England and Wales and Ireland have provided a public slaughter-house, power be conferred on them to declare that no other place within the town or borough shall be used.

A period of three years to be allowed for making the change.

(b.) The local authorities be empowered to require all meat slaughtered elsewhere than in a public slaughter-house, and brought into the district for sale, to be taken to a place or places where such meat may be inspected.

(c.) That when a public slaughter-house has been established inspectors shall be engaged to inspect all animals immediately after slaughter, and stamp the joints of all carcasses passed as sound.

2. Special arrangements are recommended for London.

3. With regard to slaughter-houses in rural districts, the case is not so easy to deal with. But the difficulty is one that must be faced, otherwise there will be a dangerous tendency to send unwholesome animals to be slaughtered and sold in small villages where they will escape inspection. The Commissioners recommend, therefore, that in Great Britain the inspection of meat in rural districts be administered by the

County Councils. In Ireland the duty of carrying out inspection ought to devolve upon authorities corresponding as nearly as possible to those charged with that duty in England and Scotland.

4. That it shall not be lawful to offer for sale the meat of any animal which has not been killed in a duly licensed slaughter-house.

QUALIFICATIONS OF MEAT INSPECTORS.

5. The Commissioners recommend that in future no person be permitted to act as a meat inspector until he has passed a qualifying examination, before such authority as may be prescribed by the Local Government Board (or Board of Agriculture).

The Commissioners give a syllabus of the subjects of examination.

TUBERCULOSIS IN ANIMALS INTENDED FOR FOOD.

6. The Commissioners recommend that the Local Government Board be empowered to issue instructions from time to time for the guidance of meat inspectors, prescribing the degree of tubercular disease, which, in the opinion of the Board, should cause a carcase, or part thereof, to be seized.

Pending the issue of such instructions the Commissioners are of opinion that the following principles should be observed in the inspection of tuberculous carcasses of cattle :

- | | | |
|--|---|--|
| (a.) When there is miliary tuber- | } | The entire carcase
and all the organs
may be seized. |
| culosis of both lungs - - | | |
| (b.) When tuberculous lesions are | | |
| present in the pleura and peri- | | |
| toneum - - - - | | |
| (c.) When tuberculous lesions are | } | |
| present in the muscular system, | | |
| or in the lymphatic glands em- | | |
| bedded in or between the muscles | | |
| (d.) When tuberculous lesions exist | } | |
| in any part of an emaciated car- | | |
| case - - - - - | | |

(a.) When the lesions are confined to the lungs and the thoracic lymphatic glands - - - -	} The carcase, if otherwise healthy, shall not be condemned, but every part of it containing tuberculous lesions shall be seized.
(b.) When the lesions are confined to the liver - - - -	
(c.) When the lesions are confined to the pharyngeal lymphatic glands - - - -	
(d.) When the lesions are confined to any combination of the foregoing, but are collectively small in extent - - - -	

In view of the greater tendency to generalisation of tuberculosis in the pig, the Commissioners consider that the presence of tubercular deposit in any degree should involve seizure of the whole carcase and of the organs.

In respect of foreign dead meat, seizure shall ensue in every case where the pleuræ have been "stripped."

It will be observed that in the foregoing recommendation there are certain conditions under which "the carcase of otherwise healthy animals shall not be condemned," but the tuberculous portions seized.

I think it well to quote the previous statement of the Commissioners regarding the disposal of the flesh of animals affected by tuberculosis which may still be considered fit for human food:—

"When, some years ago, tuberculosis in human beings and other animals was first proved to be interchangeable, we think that an exaggerated view was taken of the extent of the danger arising from meat, and that this view is still acted on in certain places. Undoubtedly we are not prepared to recommend that indiscriminate traffic in tuberculous meat should be permitted, or that inspection should be more lax than it is at present. On the contrary, we

strongly urge that inspection should not only be more general and systematic, but that all inspectors should be qualified by special training. We hold, however, that it should be conducted on better defined principles, and that some limit should be observed in the latitude permitted to medical or veterinary officers in fixing independent standards of soundness in different places.

“The recommendation on this subject which we shall place at the close of this Report will be much on the lines of the resolutions passed at the International Veterinary Congress held at Berne in 1896. We bear in view the remarkable returns of the results of rigid but discriminating inspection in 29 towns in Saxony during the year 1895. Meat Inspectors at the public abattoirs in these towns are all qualified veterinary surgeons. Tuberculosis was found to exist in 22,758 carcasses (being 27·48 per cent. of the whole number slaughtered). The whole of these according to the practice of some authorities in this country would have been confiscated and destroyed without compensation. But in Saxony they were dealt with as follows: Of the total number of 22,758 carcasses showing tuberculous lesions 21,062, or 92½ per cent., *were passed as fit for food*; 1,256 carcasses, or about 5½ per cent., were disposed of in the Freibank as inferior meat, at a fixed cheap rate; and the remaining 440 carcasses, or 2 per cent. of the whole number pronounced tuberculous in a greater or less degree, were condemned as unfit for food and destroyed.

“We have been favourably impressed with the value of the peculiar institution known in Germany as the Freibank and alluded to in the last paragraph. It is a department of the slaughter-house where meat of carcasses affected by disease, but not to such an extent as to render it unfit for food, is exposed for sale. It is sold at about half the market rate in portions not exceeding 10 lbs. to each customer, either

having been sterilised by exposure to steam for half an hour, at a temperature of 100° C., or, where the quality of the meat is considered to warrant it, in a raw state. No butchers, meat salesmen, or restaurant keepers are allowed to purchase at the Freibank, but many poor people, who would otherwise have to go without meat altogether, are able to buy cheap and not unwholesome meat at a very low rate, and the demand is usually found to exceed the supply. Under an efficient system of inspection, we regard the Freibank as a most desirable adjunct to a public slaughter-house, and one that would protect the poor from the unwholesome supplies at present obtained in some of our large towns from the lowest class of butchers."

It is scarcely necessary to point out that the sale of any portion of a tuberculous carcase for human food should be guarded with special precautions. It seems these are fulfilled by the Freibank arrangements carried out in Saxony, but which I am afraid would not be acceptable in this country.

To continue the recommendations of the Commissioners :

DISEASES IN THE UDDERS OF COWS.

7. We recommend that notification of every disease in the udder shall be made compulsory, under penalty, on the owners of all cows, whether in private dairies or those of which the milk is offered for sale.

8. We recommend that for the purpose of excluding from their districts the milk of cows affected with tuberculosis of the udder, or exhibiting clinical symptoms of the disease, local authorities should be given powers somewhat similar to those of sections 24-27 of the Glasgow Police (Amendment) Act, with power to slaughter such cows subject to compensation under the conditions named in the Report.

9. We also recommend that powers shall be given to local

authorities to take samples and make analyses from time to time of the milk produced or sold in their districts, and that milk vendors shall be required to supply sufficient information as to the sources from which their milk is derived.

At ports where milk and milk products are received from foreign countries, any costs that may be thus incurred in their examination shall be borne by the importers.

COWSHEDS, BYRES, &C.

10. We recommend that the Local Government Board be empowered to require local authorities to adopt regulations as to dairies, cowsheds, &c., where that shall be found not to have been done already.

11. That in future no cowshed, byre or shippon, other than those already registered, shall be permitted or registered in urban districts within 100 feet of any dwelling house; and that the discontinuance of any one already existing shall be ordered on the certificate, either of the medical officer of health that it is injurious to the health of human beings residing near it, or of the veterinary inspector that it is not a place wherein cows ought to be kept for the purpose of milk supply, and that it is incapable of being made so.

12. That the conditions of the attached cowsheds that shall warrant the registering of a dairy in a populous place, whether technically urban or rural, in the future shall include the following:—

1. An impervious floor. 2. A sufficient water supply for flushing. 3. Proper drainage. 4. A depot for the manure at a sufficient distance from the byres. 5. A minimum cubic contents as regards such districts of from 600 to 800 feet for each adult beast varying according to the average weight of the animals. 6. A minimum floor space of 50 feet to each adult beast. 7. Sufficient light and ventilation.

While we have prescribed a minimum cubic contents and floor space without mentioning definite dimensions affecting ventilation and lighting, we are distinctly of opinion that these are by far the most important, and that requirements as to cubic and floor space are mainly of value as tending to facilitate adequate movement of air.

Existing cowsheds should be obliged to conform to the prescribed regulations within a period of twelve months from the time of the regulations coming into force.

13. The same conditions as those recommended for populous places should apply to cowsheds in sparsely populated places, except in so far as cubic contents per cow are concerned [with certain relaxation to suit circumstances].

14. We recommend that where cows housed in one district supply milk to another district, the local authority of the district in which the cows are housed shall be bound, when required, to supply to the local authority of the district in which the milk is sold or consumed full information and veterinary reports regarding the condition of the cows, byres, &c., whence the milk is drawn. Where the local authority of one district are dissatisfied with the reports so obtained, they may apply to the Local Government Board, with a view to an independent inspection and report being made.

ELIMINATION OF BOVINE TUBERCULOSIS.

15. We recommend that funds be placed at the disposal of the Board of Agriculture in England and Scotland and of the Veterinary Department of the Privy Council in Ireland, for the preparation of commercial tuberculin, and that stockowners be encouraged to test their animals by the offer of a gratuitous supply of tuberculin and the gratuitous services of a veterinary surgeon on certain conditions.

These conditions shall be :—

(a.) That the test be applied by a veterinary surgeon.

(b.) That tuberculin be supplied only to such owners as will undertake to isolate reacting animals from healthy ones.

(c.) That the stock to be tested shall be kept under satisfactory sanitary conditions, and more especially that sufficient air space, ventilation, and light be provided in the buildings occupied by the animals.

16. We recommend that the Board of Agriculture in England and Scotland and the Veterinary Department of the Privy Council in Ireland undertake the circulation among agricultural societies of instructions for the proper use of the tuberculin test, with explanation of the significance of reaction, and directions for effective isolation of reacting animals."

I think it well here to refer to a point in connection with the tuberculin test which may escape the notice of some. In the Report of the Royal Commission of 1890-94, in the evidence of Professor McFadyean, it is stated that in his hands the tuberculin test has frequently led to erroneous inferences, although he expresses confidence in its general utility. In the Report of the Commission of 1896, however, this point is cleared up, and the Commissioners accept the reliability of the test. The evidence of Professor McFadyean in this connection, before the 1896 Commissioners, is as follows:—

"No person, whether he were a layman or a veterinary surgeon, when summoned to look at an animal suspected of showing symptoms of tuberculosis, could give an opinion that was really of much value in the great majority of cases unless he used tuberculin. We have all recognised that within recent years. If the animal is in the very last stage of the disease one may make a diagnosis that has little chance of error, but in the great majority of cases it is only

a guess. With tuberculin it is practically a certainty. I should like, if I am not going too fully into that, to give evidence regarding the reliability of tuberculin as a test. I made a number of experiments on that, and reported them to the previous Royal Commission. These, however, were not entirely favourable to the use of tuberculin, because in a considerable proportion of cases the indication afforded by the tuberculin was wrong. But since that, experiments and observations made in somewhat different circumstances have yielded entirely different results, and I have the most implicit faith in tuberculin as a test for tuberculosis, when it is used on animals standing in their own premises, and undisturbed. It is not a reliable test when used on cattle in a market, or on any cattle that have been shipped, or trained, or otherwise excited. That has been found out since I made my Report. Other observers have had similar results under similar circumstances. Unfortunately the Royal Commission set apart a very small sum to test this question of diagnosis; I think it was £100. Tuberculin was only newly introduced then, and I could not get anybody who would submit his cows to the test. It was only through the kindness of Professor Brown, who allowed me to use the test on animals condemned under the Pleuro-Pneumonia Slaughter Order, that I was able to make the test. I got these animals in slaughter-houses, and after they had been trained, or otherwise brought there, tested them. Then they were killed next day, and a considerable proportion of errors were found. But since that, using it on animals in their own premises, I have found that it is practically infallible. I have notes here of one particular case that I might put in, where in a dairy 25 animals in all were tested, and afterwards they were all slaughtered. There was only one animal that did not react, and it was the only animal not tuberculous when they were killed."

I have to express my full concurrence in all these recommendations of the Commissioners except, possibly, that which relates to the sale for food of portions of tuberculous animals, which does not appear to me to be sufficiently safeguarded. It is right to add that there is a memorandum or supplemental report by three of the Commissioners, in which they recommend that compensation should be granted to persons whose meat may be seized on account of the presence of tuberculosis. There was a considerable amount of evidence laid before the Commission supporting the view put forward in this supplemental report. I do not propose to discuss the question of compensation, it being somewhat out of place here, but I quite agree with the view that compensation should be made for meat compulsorily seized. The limitations suggested seem fair, and also appear to fully satisfy the Butchers' Association of the United Kingdom, of which Mr. Field, M.P., is Chairman.

I hope I have said enough to convince the Academy that the great prevalence and destructiveness of tubercular disease constitute a most formidable danger to the public health, and I would appeal to all members of the Academy to use their efforts to further the movement for the Prevention of Consumption and other forms of tuberculosis, which, now that it has gained some hold on public opinion, has every prospect of meeting with a large measure of success.

In conclusion, I have to return my thanks to Mr. P. J. O'Neill, the Superintendent of the Statistical Branch of the General Register Office, for his kind assistance in arranging and revising the statistical portion of this paper, and in the correction of the proofs.

A STATISTICAL INQUIRY INTO THE DISTRIBUTION OF TUBERCULOSIS IN IRELAND.

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Fellow of the Royal Institute of Public Health ;

Fellow and Member of Council of the British Balneological and Climatological Society.

[Read in the Section of State Medicine, February 17, 1899.]

At the present day the prevention of tuberculosis stands out the most prominent and urgent, if not also the most practical, question in State Medicine. Evidence of this comes to the front on all sides. At medical association meetings and sanitary congresses, in scientific journals and largely in the newspaper press the prevention of tuberculosis forms a theme for universal discussion. An influential organisation is already at work to educate the public in the great need of sanitary reform. His Royal Highness the Prince of Wales has graciously identified himself with the movement by presiding at an anti-tuberculosis meeting lately held at Marlborough House. Let us hope that this auspicious gathering may stand a historic landmark in the annals of Public Health, indicating a period when active hostilities were for the first time declared against a whole order of enormously destructive diseases. It should be gratifying to us that Ireland was represented on that occasion by a distinguished Fellow of this Academy. Enthusiasm such as has been displayed in connection with this movement does not arise without something real to stir it up. What has this been? The accumulation of evidence establishing the contagious character, the curability and the preventability of these diseases.

It would not be quite correct, however, to assert that the

prevention of tuberculosis by certain hygienic measures was either unknown or unpractised prior to Koch's brilliant discovery in 1882. It had been, for example, well established for many years by the investigations of Buchanan and others in England, and by Bowditch in America, that drainage of the subsoil in towns exerted a beneficial influence on phthisical mortality, measurable by the death rates. Again, it had not escaped general observation that certain dust-inhaling occupations favoured the development of phthisis, and that the greatest freedom from that disease obtained amongst those whose vocations were carried on in the open air. It was also known—more than fifty years ago—that tubercular material from dead subjects inoculated into animals produced the disease. Why subsoil drainage and outdoor occupations acted prophylactically, or why the disease was an inoculable one, were for the time unsolved problems, yet incontestable facts. The discovery of the bacillus and our widening knowledge of its life-history enable us to comprehend much that, not many years ago, was at best problematical.

In 1887 a comprehensive and valuable paper on the "Prevalence of Phthisis in Ireland" was read before this section by Dr. Grimshaw, Registrar-General. Briefly, his facts and findings were as follow: Phthisis caused more than one-tenth of all registered deaths in Ireland, its rate being 19·6 per 10,000 of the population. In the large urban districts an excessive rate prevailed, amounting in Belfast to 39, in Dublin to 34·2, in Cork to 33·8, &c. A straight line drawn between Derry and Skibbereen divides Ireland into two markedly dissimilar social districts, the western being the poorer and more rural. Unions to the east of this dividing line, for the most part, showed higher death-rates from phthisis than those west of it. This was only partially accounted for by towns, and did not explain the prevalence

of phthisis in Meath, Westmeath, Kildare, Wicklow, and Wexford, where occupations were quite as rural as in Connaught, and where dwellings were better. Tables of house accommodation in the counties seemed to show that, where these were most primitive and defective, phthisis was least prevalent. Mortality tables for all the unions of Ireland, giving for each its percentage of bog and marsh and also of barren mountain land, pointed strongly to a relationship between these physical features and the distribution of phthisis, the lower death-rates being recorded in a majority of those unions having the largest proportions of bog, marsh and mountain. Geological formation did not appear to explain anything, neither did barometrical pressure; but, where equability of climate was most pronounced, where rainfall was heaviest, and in elevated districts generally, phthisis was less prevalent than under reversed conditions.

In the present paper I hope to furnish statistical proof that the distribution of phthisis in Ireland, and to a still greater degree of other forms of tuberculosis, is governed almost exclusively by aggregation of population in towns and villages. I shall not deny the possibility of subsidiary influences, but I shall stoutly maintain that these are, all through Ireland, literally dwarfed by the one dominating influence mentioned. Preparatory to a discussion of the registration returns for 1897, upon which I shall ground my case, I beg your attention to our national condition as regards tubercular diseases within the past quarter of a century. In the year 1871 there died in Ireland from all forms of tuberculosis 13,780 persons. In 1897 the number was 13,009. At sight, this appears somewhat favourable; but, as there were some 860,000 fewer persons alive in Ireland in 1897 than in 1871, it is evident that we have to reckon with, not a decrease, but a decided increase in the death tribute levied by tuberculous diseases *en masse*. The

deaths from phthisis alone, which in 1871 numbered 10,427, fell to 9,478 in 1897; but this also, and for the same reason, is a retrogressive change. From *tabes mesenterica* and tubercular meningitis combined 2,501 deaths occurred in 1871, 2,181 in 1897. These figures, applied to the populations existing at the two periods, show a trifling increase of mortality which only accentuates the fact that our present position with regard to tuberculosis is worse than it was twenty-seven years ago. We shall best serve the Public Health interests of our country by neither attempting to disguise nor ignore this unpleasant truth.

Let us now inquire what progress has been made in England and Wales in the prevention of tuberculosis within the past half century. During the decennium 1851-60, the death-rate there per million of the population from all forms of tuberculosis was 3,483. In the period 1891-95 it had fallen to 2,122, *i.e.*, it had decreased by 39·1 per cent. The Irish rate per million in 1871 was 2,546; in 1897 it had risen to 2,851, which is equal to an increase of 12 per cent. From phthisis alone the English death-rate during 1851-60 was 2,679; in the period 1891-95 it had fallen to 1,463, or had decreased by 45·4 per cent. In Ireland the phthisis death-rate per million in 1871 was 1,922; in 1897 it had reached 2,142, which represents an increase of 11·5 per cent. In the mortality from *tabes mesenterica* at all ages there has been a slight decrease in both countries, amounting in England to 8·5 per cent. and in Ireland to 5 per cent. In the deaths from *tabes mesenterica* under the age of one year there has been in England a large increase during the forty-five-year interval under review, amounting to 27·7 per cent. From want of data for 1871, I am not able to form an estimate of how we now stand in Ireland as regards mesenteric tuberculosis during the first year of life.

If we divide the 83,839 deaths from all causes which were

registered in Ireland in 1897 into those occurring under and over the age of fifteen, we shall find 22,811 in the former class and 61,028 in the latter. As relative mortality at the several age-groups for an entire country remains practically constant from year to year, we are not wide of the truth in assuming, as a normal state of affairs in Ireland, that about 27 per cent. of all deaths occur under the age of fifteen and 73 per cent. over it. The Registrar-General classifies deaths from tuberculosis under four headings—(1) “*Tuberculosis Mesenterica*,” (2) “*Tubercular Meningitis*,” (3) “*Phthisis*,” (4) “*Other forms of Tuberculosis Scrofula*.” On analysing the figures under these headings at the several age-groups, it comes out that about 91 per cent. of the mesenteric, and 93 per cent. of the meningeal, deaths occur under the age of fifteen, that more than 91 per cent. of the mortality from phthisis occurs after the age of fifteen, and that the deaths under “*Other forms of Tuberculosis*” occur in the proportions of about 53 per cent. under and 47 per cent. over the same age. As there is no means in the official returns of following out the deaths under the fourth heading in the counties and large urban districts, I have been obliged to eliminate them from consideration. The omission, however, is not very material, for two reasons—(1) these deaths form only about 8 per cent. of all tuberculous deaths, and (2) their evenly balanced distribution under, and over the age of fifteen does not touch the main question of tuberculosis as affecting the juvenile and adult portions of large communities. As the combined deaths from *tuberculosis mesenterica* and *tubercular meningitis* amounted in 1897 to 2,181, and those from *phthisis* to 9,748, there is here a numerical relationship not widely different from that which obtains between deaths from all causes under and over the age of fifteen.

[Here the lecturer introduced Table I., showing the distribution of tuberculosis mortality in the counties.]

The summarised statement for Ireland forms a standard for comparative estimations. It is seen, leaving out of count the deaths under the Registrar-General's fourth heading, "Other forms of Tuberculosis Scrofula," that the rate of mortality per million of the Irish population from tuberculosis is 2,536, of which 2,072 are adults and 464 young persons. Let attention be now given to the county death-rates from combined mesenteric and meningeal tuberculosis.

The extremes are Fermanagh and Dublin, and be it noted that the metropolitan county shows fully eighteen times worse than the Ulster one in this matter of early death from tuberculosis. Following Dublin, in the order of their destructiveness of young lives, are the counties of Antrim, Down, Waterford, Armagh, Kildare, Limerick, and Wexford, all of which exceed the general rate for Ireland. Next to Fermanagh, the lowest rates are found in Roscommon, Leitrim, Cavan, Donegal, Clare and Longford. While the counties showing high mesenteric and meningeal mortality also show high general death-rates, and the last-mentioned counties low, it will be observed that Kerry, with a crude death-rate of 12·8 only, is by no means so exempt from tuberculosis as several of the other counties. I shall revert to this. As regards the death-rates from phthisis per million living, the lowest rate here is found in Donegal, and the highest again in Dublin. The figures 1,411 and 3,058 are sufficiently apart to claim our best study, although phthisis in Ireland is not marked by that vast range of mortality between different localities which characterises those forms of tuberculosis which destroy life at early ages. Antrim, with a mortality figure of 2,990, follows Dublin much closer in its adult than in its juvenile life-sacrifice. Down comes a not very close third with 2,625, after which follow, in order, Armagh, Wexford, Tyrone, Cork, Meath, and Waterford. Tracing the counties showing the lowest death-rates from phthisis we find them, after Donegal, in the

order of Cavan, Longford, Clare, Leitrim, Fermanagh, Galway, and Mayo. Taking the combined mortality from mesenteric, meningeal, and pulmonary tuberculosis, the most tuberculous counties in Ireland are unquestionably Dublin, Antrim, Down, Armagh, Wexford, and Waterford; and the least tuberculous Donegal, Cavan, Longford, Fermanagh, Clare, and Leitrim. The most tuberculous counties, therefore, occupy a line on the eastern and south-eastern sides of the island, broken between Down and Dublin, and also at Wicklow. They are, with the exception of Armagh, maritime counties. The region of greatest freedom from tuberculosis covers a large territory of five contiguous counties in the north-west, bounded on the north by the sea, and on the south by the two Meaths. Clare forms a detached centre of low mortality on the west coast. It may be worth noting that, throughout Ireland, mesenteric and meningeal tubercular deaths stand to deaths from all causes in the ratio of 26 to 1,000, and that the proportion for phthisical deaths is 116. About one-half the counties of Ireland show higher proportionate rates than Dublin. For the true explanation of this we must turn to the crude death-rate. The figure 27·1 for County Dublin is so disproportionately swelled by other fatalities as to give its comparative phthisical rate a low value. Antrim and Down both show higher than Dublin because their crude death-rates are lower.

With regard to the increased destructiveness of tuberculosis in the large urban districts a cursory glance shows that the figures are larger than in the counties. Taking the sixteen districts collectively, and in comparison with the remainder of Ireland, the evil effects of urbanisation stand well declared. Roughly, children in the cities of Ireland die from tuberculosis at two and a half times the rate they do in the country at large, and adults die at one and a half times their rate. In the

remainder of Ireland children are four times, and adults twice, as safe as in the cities. I shall, in my concluding table, prove that the difference of rate, in respect of both juvenile and adult mortality from tuberculosis, is much wider when strictly rural and urban Ireland are brought into statistical comparison. Some of the more striking figures opposite individual cities will arrest attention. They disclose situations, the gravity of which makes them profoundly interesting to the sanitarian and statistician. Belfast, with mortality figures of 1,371, 3,862, and 5,233, is the most fatal centre of tuberculosis in Ireland. After it, in the order of juvenile mortality, come Dublin, Armagh, Cork, Londonderry, Wexford, and Waterford. It is needless to observe that the whole of these city rates are greatly in advance of those of the counties in which they are situated. As regards phthisis, Dublin, with a figure of 3,298, comes only seventh in the order of fatality, and it is interesting to note that such small urban districts as Kilkenny, Lisburn, and Lurgan actually show higher phthisical death-rates than the metropolis. It is also seen, however, that Kilkenny shows a mesenteric and meningeal mortality under one-third that of Dublin, that Lisburn's is less than one-half, and that Lurgan's is, for an Irish urban rate, not excessive. Galway shows to conspicuous advantage in its death-rate from *tabes mesenterica* and tubercular meningitis. Dundalk is the least phthisical of the cities. Six districts show death-rates from all forms of tuberculosis exceeding 4,000 per 1,000,000 living. These are Belfast, Armagh, Dublin, Cork, Wexford and Lurgan. Three only are under 3,000—Galway, Dundalk and Drogheda. The only large urban district, in which mesenteric and meningeal mortality sinks below that of the remainder of Ireland, is Galway. In no district is there any approach to the remainder of Ireland as regards phthisis. The most distinguishing mark of urbanisation in Ireland—and it is dis-

tinctive and characteristic beyond all question—is the high ratio which combined mesenteric and meningeal mortality bears to phthisis or to total tuberculosis. In passing I would observe that the size of these urban districts individually bears no correspondence either with their general or tuberculous death-rates. Armagh's crude death-rate stands nearly midway between those of Belfast and Dublin. As a tuberculous centre it is second only to Belfast, standing well ahead of Dublin.

Throughout Ireland there are 352 towns with populations ranging from 10,000 down to 500. Without precise knowledge of the proportions which these small urban communities bear to the total populations of the several counties in which they are located, it appears to me to be utterly impossible to understand the distribution of tuberculosis, however correctly we may measure it. Thus far, however, I can assever without fear of contradiction—that urban communities with populations under 10,000 and over 500 are much more destructive of life from tuberculous diseases than exclusively rural districts.

It is, I think, impossible to rise from a study of the four tables submitted without coming to the conclusion that there is but one agency standing out clearly as a regulator of the distribution of tuberculosis in Ireland—namely, the aggregation of people into urban communities, small as well as large. There is no instance of a county having a markedly high tuberculous death-rate with a small percentage of town-dwellers, nor is there any having a high, or even a moderate, percentage of urban population, that is not also marked by a high tuberculous death-rate. That geographical position, physical features or climatic influences have nothing, or next to nothing, to do with the distribution of tuberculosis in Ireland is demonstrable by statistical analyses, conducted where you will. Take the counties of Clare, Cavan, and Armagh side by side, and see

what the comparison proves. Clare lies to the west of Dr. Grimshaw's social dividing line, Cavan and Armagh to the east. Clare is maritime, the others inland. The mean annual temperature in Clare is about 51° ; Cavan lies in the heart of the coldest region in Ireland, with a mean temperature under 47° ; the isotherm of 48° cuts through Armagh. Bog and mountain form about one-fifth of Clare, one-eighth of Cavan, not over one-tenth of Armagh. Clare's rainfall is heavy, Cavan's is light, Armagh's neither. Mesenteric and meningeal mortality is low in Clare, still lower in Cavan, four times as heavy in Armagh. Phthisis death-rates are moderate in Clare, low in Cavan, more than one and a half times heavier than either in Armagh. Clare's percentage of town-dwellers is thirteen, Cavan's ten, Armagh's thirty. The Registrar-General's paper localises, by a mass of valuable and authentic statistics, every small union area throughout the country where the highest and lowest phthisical death-rates prevail. Were his laborious work to be re-done on the same lines for the succeeding decennium, identical results would be found. He found the union of Cahirciveen, from which I write, remarkably free from phthisis. So do I; but Kerry is not one of those counties which we can call very free from tuberculosis. Why? Because it stands nineteenth in the order of urbanisation. To illustrate the point I have in view, let me divide the county into two statistical regions—North Kerry, to comprise the unions of Tralee, Killarney, and Listowel; and South Kerry to be formed of the remaining three unions, Cahirciveen, Dingle, and Kenmare. Calculations worked out will show, in North Kerry, that the combined mesenteric and meningeal mortality figure stands at 300, the phthisical one at 2,051 and that from tuberculosis in general at 2,351. In South Kerry the corresponding rates are 186, 980, and 1,166. While North Kerry is thus more

tuberculous than twenty of the Irish counties, South Kerry is considerably less tuberculous than Donegal.

Is it rational that the explanation has any reference to bog, marsh, mountain elevation, temperature, pressure, rainfall or house accommodation? No. The sole and sufficient reason is that there is a town-dwelling percentage of nineteen in North Kerry and nine only in South Kerry. If we place the unions of Tralee and Cahirciveen side by side for statistical comparison, we shall find the former to be three times more tuberculous than the latter, but also three times more urban. Before leaving this part of my subject, I would make brief reference to those counties in which Dr. Grimshaw thought the phthisis death-rates not sufficiently explained by towns—namely, Meath, Westmeath, Kildare, Wicklow, and Wexford. Of these five counties, Wexford is the only one having a tuberculous death-rate exceeding that of Ireland. Its tuberculous position is undoubtedly higher than 24 per cent. of urban inhabitants would account for. Might it be that the clay soil of this county, which rests on a subsoil of clay slate, has some share in giving it the tuberculous character it has? Meath, confessedly, is not easy to understand. I have subjected all the calculations referring to it to careful logarithmic revision and find everything correct. It stands alone amongst the rural counties of Ireland as disproportionately tuberculous. Having no acquaintance with the county, I cannot offer an explanation. If there was an undue proportion of insanitary villages in Meath under 500 population, it might explain matters, but I am not aware that there are. With reference to Westmeath, Wicklow, and Kildare, I see nothing in their several tuberculous death-rates inconsistent with or not sufficiently explained by their respective proportions of town-dwellers.

Urban Ireland includes every city and town in the country with a population over 500. Included in rural Ireland, there-

fore, are all villages and hamlets under 500. For public health statistical purposes I should consider this division more thorough than the more usual one into urban and rural sanitary districts, which mixes up town and country dwellers somewhat confusedly.

Finding 20·2 to be the average death-rate per 1,000 of all the small towns in Ireland, it was easy to determine that 11,498 deaths should occur in a population of 569,234. Having found the deaths in the small towns, full data for the completion of the table were readily found. Children die in rural parts from mesenteric and meningeal tuberculosis at the rate of 181 per 1,000,000 of the population, and in the large towns at 1,125. The statistical value of these figures is enhanced by the fact that they are on a national scale. Their signification will be still better manifested by looking at them alongside the general death-rates. Here we find a difference of 9·6 per 1,000 between rural Ireland and the large towns. To every 100 deaths from all causes which occur in Ireland, the ratio in the rural districts is 83, in the small towns 113, and in the large towns 148. Let us see what the proportionate figures are for tuberculosis. To every 100 mesenteric and meningeal deaths in the country, the rural proportion is only 39, that of the small towns 186, and that of the large towns 242; or, in other words, the small towns kill children by tuberculosis at nearly five times the rate of the rural districts, and the large towns at more than six times. To every 100 deaths in Ireland from phthisis, the rural district ratio is 76, the small town 124, and the large town 162; or, the small towns destroy adults at more than one and a half times the rate of the rural districts, and the large towns at fully double the rate. In all death-rates as between rural districts, small towns, and large urban centres, we find the operation of one universal law; but with what tragic import is it proclaimed when we search the statistics of tuberculosis in early life!

It would be transgressing to pursue the subject further. To discuss fully the etiological point why aggregated populations suffer so disproportionately would be foreign to a collection of figures demonstrating the fact only that tuberculosis in Ireland is a town-bred disease. It is often, however, logically possible to infer from a given or proved fact a consequential or included one. Tuberculosis is a town-bred disease, because it is a house-bred one. Inside dwellings there is an absence of pure aerial currents and of bright sunlight, two potent destroyers of the tubercle bacillus. In those insanitary abodes where air-sewage accumulates, and where the victims of tuberculosis are to be found, is it not reasonable to conclude that the disease is house-bred because of the atmospheric pollution existing, or, briefly, because it is also filth-bred? When calculating the death-rate of the small towns, it may be useful to say here that remarkably little differences were found amongst them. It was not unusual to find the crude death-rate in towns of 1,000 and 2,000 as high as in those of 7,000 to 10,000. The destructiveness of the smallest towns must not be lost sight of in further investigations into tuberculosis.

We have yet to learn what residuum of tubercular diseases arises in the isolated households of the country. Statistics, even to the limited extent dealt with in this paper, warrant a belief that mesenteric and meningeal mortality may be found almost nil over large areas in detached rural dwellings. The balance of phthisical disease, however, developed in rural localities must be considerable. In view of the crusade initiated against tuberculosis, it would be highly desirable to have every locality in the kingdom stätistically investigated with some minuteness as to the prevalence of the disease in its several forms. A medical officer of health for each county in Ireland, specially trained in preventive medicine, seems a *sine qua non* for success. Our sanitary organisation is not equal to our needs, and our newly appointed County Councils have no sanitary functions.

TABLE I.—*Tuberculosis in the Counties.*

Counties	1	2	3	4	5	6	7	8	9	10
	Population last Census	Deaths, 1897	Crude Death-rate	Deaths from Tuberculosis and Meningitis	Deaths from Phthisis	Deaths in Column 4 to 1,000 Deaths from all Causes	Deaths in Column 5 to 1,000 Deaths from all Causes	Death rate per million of Population from Tuberculosis and Mesenterica and Tubercular Meningitis	Death-rate per million of Population from Phthisis	Death-rate per million of Population from all forms of Tuberculosis
Carlow	40,936	684	16.7	15	73	22	107	366	1,783	2,149
Dublin	419,216	11,377	27.1	513	1,282	45	113	1,224	3,058	4,282
Kildare	70,206	1,133	16.1	37	134	32	118	527	1,909	2,436
Kilkenny	57,231	1,402	16.1	24	165	17	118	275	1,891	2,166
King's Co.	65,563	1,056	16.6	28	115	26	106	427	1,754	2,181
Longford	52,647	822	15.6	8	77	10	94	152	1,463	1,615
Louth	67,874	1,078	15.9	26	130	24	121	383	1,915	2,298
Meath	80,151	1,326	16.5	32	167	24	126	399	2,084	2,483
Queen's Co.	64,883	1,046	16.1	20	116	19	111	308	1,788	2,096
Westmeath	65,109	1,164	17.9	11	123	9	106	169	1,889	2,058
Wexford	111,778	1,969	17.6	53	244	27	124	474	2,183	2,657
Wicklow	62,136	971	15.6	19	139	20	112	306	1,754	2,060
Clare	124,483	1,758	14.1	13	186	10	106	145	1,493	1,643
Cork	438,422	7,276	16.6	188	923	26	128	429	2,117	2,546

Kerry	179,136	2,301	12.8	46	297	20	129	257	1,658	1,915
Limerick	158,912	2,577	16.2	77	302	30	117	485	1,900	2,385
Tipperary	173,188	2,835	16.4	32	303	11	108	185	1,761	1,946
Waterford	98,251	1,773	18.0	55	201	31	113	560	2,046	2,606
Antrim	428,128	9,866	23.0	400	1,280	41	130	934	2,990	3,924
Armagh	143,289	2,777	19.4	79	324	28	117	553	2,266	2,819
Cavan	111,917	1,614	14.4	16	163	10	101	143	1,456	1,599
Donegal	185,635	2,927	15.8	27	262	9	90	145	1,411	1,556
Down	267,059	5,320	19.9	180	701	34	132	674	2,625	3,299
Fermanagh	74,170	1,142	15.4	5	116	4	102	67	1,564	1,631
Londonderry	152,009	2,857	18.8	63	274	22	96	414	1,802	2,216
Monaghan	86,206	1,447	16.8	25	139	17	96	290	1,612	1,912
Tyrone	171,401	3,037	17.7	64	365	21	120	373	2,129	2,502
Galway	214,712	3,184	14.8	39	338	12	106	182	1,574	1,756
Leitrim	78,618	1,115	14.2	10	120	9	108	127	1,526	1,653
Mayo	219,034	3,034	13.9	38	347	13	114	173	1,584	1,757
Roscommon	114,397	1,564	13.7	13	183	8	117	113	1,600	1,713
Sligo	98,013	1,377	14.0	20	182	15	132	204	1,857	2,061
Ireland	4,704,750	83,839	17.8	2,131	9,748	26	116	464	2,072	2,536

TABLE II.—*Tuberculosis in the Large Urban Districts.*

	1	2	3	4	5	6	7	8	9	10
Urban Districts	Population last Census	Deaths, 1897	Crude Death-rate	Deaths from Tubercles Mesenterica and Tubercular Meningitis	Deaths from Phthisis	Deaths in Column 4 to 1,000 Deaths from all Causes	Deaths in Column 5 to 1,000 Deaths from all Causes	Death rate of Population from Tubercles Mesenterica and Tubercular Meningitis	Death-rate per million of Population from Phthisis	Death-rate per million of Population from all forms of Tuberculosis
Drogheda	17,168	348	20.3	8	43	23	124	456	2,505	2,971
Dublin	349,594	10,118	23.9	452	1,153	45	117	1,293	3,298	4,591
Dundalk	17,221	313	18.2	15	36	43	115	871	2,090	2,961
Kilkenny	14,812	303	20.5	6	49	20	102	405	3,308	3,713
Wexford	14,474	330	22.8	14	51	42	155	967	3,524	4,491
Cork	89,785	2,202	24.5	88	328	40	119	980	3,653	4,633
Limerick	41,828	845	20.2	27	116	32	137	645	2,773	3,418
Waterford	22,893	642	22.2	26	88	40	137	900	3,046	3,946
Armagh	12,453	355	28.5	16	45	45	127	1,284	3,613	4,897
Belfast	266,185	7,537	28.3	365	1,028	48	136	1,371	3,862	5,233
Lisburn	15,399	325	21.1	9	51	23	157	584	3,311	3,895
Londonderry	40,090	954	23.8	39	101	41	106	973	2,519	3,492
Lurgan	15,113	336	22.2	12	51	36	152	794	3,375	4,169
Newry	18,983	399	21.0	12	46	30	115	632	2,423	3,055
Galway	16,823	379	22.5	2	39	5	103	119	2,318	2,437
Sligo	16,145	217	21.5	6	45	17	130	372	2,794	3,166
The above Districts collectively	974,966	25,733	26.4	1,097	3,270	43	127	1,125	3,354	4,479
Remainder of Ireland	3,723,784	58,106	15.6	1,084	6,478	19	111	291	1,737	2,028

TABLE III.—*Urbanisation in the Counties.*

Counties	Total Populations	Urban Populations	Percentage of Urban Populations
Dublin - - -	419,216	368,036	88
Antrim - - -	428,128	277,832	65
Waterford - - -	98,251	42,039	43
Down - - -	267,059	111,504	42
Louth - - -	67,874	27,596	41
Cork - - -	438,432	175,080	40
Limerick - - -	158,912	59,868	38
Londonderry - - -	152,009	48,662	32
Armagh - - -	143,289	43,201	30
Kildare - - -	70,206	19,517	28
Carlow - - -	40,936	11,124	27
Tipperary - - -	173,188	45,822	26
Wicklow - - -	62,136	15,958	26
King's County - - -	65,563	16,582	25
Wexford - - -	111,778	27,247	24
Kilkenny - - -	87,261	19,956	23
Queen's County - - -	64,883	13,516	21
Westmeath - - -	65,109	10,935	17
Kerry - - -	179,136	28,304	16
Tyrone - - -	171,401	26,031	15
Galway - - -	214,712	30,125	14
Sligo - - -	98,013	13,427	14
Longford - - -	52,647	7,067	13
Clare - - -	124,483	16,524	13
Meath - - -	80,151	9,374	12
Monaghan - - -	86,206	9,848	11
Mayo - - -	219,034	23,157	11
Fermanagh - - -	74,170	7,760	10
Cavan - - -	111,917	10,899	10
Donegal - - -	185,635	14,210	8
Roscommon - - -	114,397	8,695	8
Leitrim - - -	78,618	4,304	5
IRELAND - - -	4,704,750	1,544,200	33

TABLE IV.—*Order of Tuberculosis Mortality in the Counties.*

	1 Positional Order of Urbanisation	2 Positional Order of Mesenteric and Meningeal Mortality	3 Positional Order of Phthisical Mortality	4 Positional Order of Tuberculosis Mortality in general	5 Positional Order of Proportion of Juvenile to Adult Tubercular Mortality
Dublin -	1	1	1	1	1
Antrim -	2	2	2	2	2
Waterford -	3	4	9	6	3
Down -	4	3	3	3	5
Louth -	5	13	10	12	12
Cork -	6	9	7	7	13
Limerick -	7	7	12	11	7
Londonderry	8	11	16	13	9
Armagh -	9	5	4	4	8
Kildare -	10	6	11	10	4
Carlow -	11	15	18	16	11
Tipperary -	12	22	19	21	21
Wicklow -	13	17	20	19	16
King's Co. -	14	10	21	14	6
Wexford -	15	8	5	5	10
Kilkenny -	16	19	13	15	19
Queen's Co. -	17	16	17	17	15
Westmeath -	18	25	14	20	30
Kerry -	19	20	22	22	20
Tyrone -	20	14	6	8	18
Galway -	21	23	26	25	22
Sligo -	22	21	15	18	24
Longford -	23	26	30	30	26
Clare -	24	27	29	28	25
Meath -	25	12	8	9	14
Monaghan -	26	18	23	23	17
Mayo -	27	24	25	24	23
Fermanagh -	28	32	27	29	32
Cavan -	29	29	31	31	27
Donegal -	30	28	32	32	28
Roscommon -	31	31	24	26	31
Leitrim -	32	30	28	27	29

TABLE V.—*Tuberculosis in the Urban and Rural Parts of Ireland.*

	1	2	3	4	5	6	7	8	9	10
	Population	Deaths	Crude Death-rate	Deaths from Tuberculosis and Mesenterica and Tubercular Meningitis	Deaths from Phthisis	Deaths in Column 4 to 1,000 Deaths from all Causes	Deaths in Column 5 to 1,000 Deaths from all Causes	Death-rates per Million of Population from Tuberculosis and Mesenterica and Tubercular Meningitis	Death-rates per Million of Population from Phthisis	Death-rates per Million of Population from Tuberculosis at all Ages
Large Towns -	974,966	25,733	26.4	1,097	3,270	43	127	1,125	3,354	4,479
Small Towns -	569,234	11,498	20.2	513	1,529	45	133	861	2,566	3,427
Urban Ireland -	1,544,200	37,231	24.1	1,610	4,799	43	129	1,043	3,108	4,151
Rural Ireland -	3,160,550	46,608	14.8	571	4,949	12	106	181	1,566	1,747
All Ireland -	4,704,750	83,839	17.8	2,181	9,748	26	116	464	2,072	2,536

THE DEATH-RATE FROM TUBERCULOSIS IN ENGLAND.

By F. C. MARTLEY, M.A., M.D., F.R.C.P.I.

[Read in the Section of State Medicine, February 7, 1899.]

Now that the question of tuberculosis is so much before the public, I thought it would be of interest if I brought before the Academy a few remarks regarding the death-rate from tubercular disease. For this purpose I have examined the rates for males only in England for the five years 1891-5. These deaths are arranged mainly under four headings—*Tabes Mesenterica*, *Tubercular Meningitis*, *Phthisis*, and *Scrofula*. Accordingly I have grouped these figures together for each year, and found that such deaths were, in—

1891	-	-	-	36,102
1892	-	-	-	33,735
1893	-	-	-	34,305
1894	-	-	-	32,138
1895	-	-	-	33,922

or, an annual average for the five years of 34,040.

Taking the male population for 1891 (*viz.*, 14,052,901), this gives a total average tubercular death-rate for each year of 242 per 100,000 living. Of course, strictly speaking, this rate should be calculated on the population calculated for the middle of 1893, but even in this particular instance it will not make a really appreciable error, and as I am chiefly referring to the relative rates between different parts of England, calculations on the population returned by the Census of 1891 will be substantially correct.

The broad fact stands out that some 240 out of every 100,000 males die of tubercular disease annually—by far the highest death-rate from preventable disease. Indeed it is only slightly surpassed by the rather extensive group of “zymotic” diseases, which average some 40,000 deaths annually to the 34,000 from tubercular disease.

I have next taken the tubercular death-rate—the average for the quinquennium—for each of twelve age-groups, namely—five-yearly ones up to the age of 25, and thereafter ten-yearly ones, and have expressed each of these rates, with reference to the number living during the same age period. The death-rates that I thus obtained, per each 100,000 living in each age-group, were as follows:—

Age				Tubercular Death-rate.
0—5	-	-	-	471
5—10	-	-	-	76
10—15	-	-	-	57
15—20	-	-	-	135
20—25	-	-	-	230
25—35	-	-	-	278
35—45	-	-	-	350
45—55	-	-	-	343
55—65	-	-	-	289
65—75	-	-	-	172
75—85	-	-	-	69
85—	-	-	-	24

This shows clearly the character of the age distribution of tubercular disease—very heavy during the first years of life, then dropping suddenly, and gradually rising to a second, though smaller maximum, about 40 or 45.

Having got these figures I was able to calculate out what death-rate from tubercular disease one might expect to be noted in each shire; for, knowing the number alive

in each age-group in each shire, I could, from this table, calculate the number that ought to die in each age-group, and by adding these numbers together I could find the total number that ought, if I may so express it, to die from tubercular disease in each shire. The result I got was somewhat unexpected. I have mentioned before that the average annual rate for England as a whole during the quinquennium 1891-5 was 242 per 100,000 living. I rather expected that in several of the shires the rate to be anticipated would be considerably above or below this figure, looking to the decidedly uneven incidence of this group of diseases at different periods of life; as a matter of fact, however, these expected rates only varied from 248·4 to 231·2 per 100,000 living.

From this I felt that sufficiently trustworthy results could be obtained—in the case of England at all events—by comparing the observed death-rate with the general rate for the whole country, without taking any account of the age distribution. But as in this instance I had calculated the expected death-rate for each shire, it was with these rates that I compared the rates actually registered.

The figures, I found, varied from 329 to 145 per 100,000 living; or to put it in another way, in some districts 80 more died per 100,000 than were expected, while in others 92 less died.

It would be tedious to go through all the different figures, but I endeavoured to summarise the results by grouping several of the shires together. This I accomplished by placing them in regular order, from the one where the greatest number of tubercular deaths was observed, to the one where the number was smallest. I then divided this column at intervals into seven groups, each containing in round numbers about 2,000,000 male inhabitants, as is shown in the following table:—

GROUP	Tubercular Deaths above or below the average of 242 per 100,000 living	No. of Inhabitants per acre
1. London	+ 80	26·7
2. Northumberland and Lancashire	+ 41	·83
3. Yorks. (W. R.), Warwick, Durham	+ 9	·67
4. Hants, Wales (North and South), Sussex, Cheshire, Yorks (E. R.)	— 7	·23
5. Devon, Cornwall, Kent, Surrey, Middlesex, Essex, Suffolk .	— 25	·32
6. Stafford, Gloucester, Cambridge, Herts., Worcester, Derby, Cumberland, Northampton, Leicester	— 38	·33
7. Rest of England	— 62	·18

Thus where the rate for the whole of England is about 240 per 100,000, in some divisions it rises to 320, in others sinks to 180; or in other words, tubercular disease is nearly twice as fatal in some parts of England as in others. On looking through this table the most striking feature is the extreme irregularity of the geographical distribution of the disease; but this is explained—partially at all events—by the last column, where I have given the number of inhabitants per acre, as this shows how closely dependent the fatality of tubercular disease is on overcrowding. I do not bring this forward as anything new, but what has been impressed on my mind is that the action of climate, important as it no doubt is, is completely overshadowed by the social condition of the population, and that the best chance of stamping out the disease is in attacking it from this standpoint. I hope to go into the purely geographical question at some future date.

THE BACTERIOLOGICAL ASPECT OF TUBERCULOSIS.

By E. J. McWEENEY, M.A., M.D. (R.U.I.), L.R.C.P.I.;
Professor of Pathology and Bacteriology, Catholic University Medical
School, &c.

[Read in the Section of State Medicine, February 17, 1899.]

DR. McWEENEY read a paper on this subject and demonstrated a series of illustrative microscopic preparations and photographs. With regard to the morphology of the tubercle fungus he mentioned that he had never failed to detect genuinely ramified forms in sputum whenever he had leisure to seek them out. The type of ramification was that of the genus *Cladothrix*, and from the researches of Fischel, Coppin Jones, Hayo Bruns, and Ledoux-Lebard, there could be no doubt of the biological affinity of the tubercle fungus with *Streptothrix* and *Actinomyces*. He gave reasons for refusing to admit the spore-nature of the unstained bodies so often found embedded in the rods, and pointed out the hygienic importance of that fact. He emphasised the value of the staining reaction, long considered to be peculiar to the tubercle and leprosy bacilli, but now known to be shared by a smegma bacillus, and by the pseudo-tubercle bacilli isolated by Moeller and others from cow-dung—by Moeller, from the leaves of Timothy grass near the Görbersdorf Sanatorium, and by Rabinowitsch, from butter. Cultures of the three last-named organisms were demonstrated as well as slides showing their remarkable resemblance to the genuine tubercle organism. The cause of the staining reaction was the presence in the sheath of the bacillus of a peculiar *wax*, as was shown last year by Aronsen. This underwent gradual extraction by alcohol and ether, with the

result that the bacilli lost their specific staining reaction, a fact which may account for their gradual disappearance from tissues that have been treated for histological purposes with these substances. The relation of the bacillus of human to that of avian and piscine tubercle was discussed and cultures of these organisms demonstrated. The discovery by Ledoux-Lebard of the bacillus of fish-tuberculosis and the recently demonstrated inoculability of poikilothermous animals with a variety of a bacillus capable of thriving at ordinary temperatures were pointed out as important recent additions to our knowledge. The pathogenesis and modes of infection of the human system were then described, and the relative frequency of the conceptional, placental and post-natal origin of the disease discussed, and determined in the light of recent research. An attempt was likewise made to appreciate the importance of the rôle played by sputum, meat and milk in the dissemination of tuberculosis, and the speaker recounted his own experiences of tuberculin injection as the diagnostic method applied to cows, and laid stress upon what appeared to be the relative infrequency of the disease amongst Irish dairy cattle. The practice of keeping them "on grass" for more than six months of each year might be regarded as an "open-air" mode of treatment applied to the bovine race. He concluded by earnestly deprecating over zeal in the adoption of measures intended to be preventive, but which by involving irksome restriction or intolerable publicity would speedily be found to defeat their own purposes.

MULLARANNY, CO. MAYO, CONSIDERED AS A WINTER HEALTH-RESORT FOR INVALIDS.

By F. J. B. QUINLAN, M.D., F.R.C.P.I.

[Read in the Section of State Medicine, February 7, 1899.]

I HAVE always considered it a matter of regret that invalids, or those who from delicacy are unable to bear our rigorous winters, should be sent to distant health-resorts, which can be reached only by long and fatiguing journeys, and I have been for some time of opinion that the exceptionally warm and equable climate of the west coast of Ireland would afford great advantages in this respect. Last summer I visited the Island of Achill, and was walking along the Keel Strand to the Cathedral Cliffs. I found that the walk along this beautiful but, alas, deserted strand (which would make the fortune of an English watering-place) was longer than I expected, and looked about for something which might be used as a walking-stick. I saw one lying at the water's edge, and evidently just cast up by the tide. I took it up, and found that it was a piece of bamboo which had travelled in the Gulf Stream, apparently from some locality near the Gulf of Mexico, and some traces of green upon it showed that the voyage had not been a very long one. I mention this occurrence merely as an evidence of the great physical phenomenon which secures a mild and equable climate to the west coast of Ireland, and in a somewhat lesser degree to that of Scotland, by keeping their atmospheres warmed by a constantly passing stream of tropically heated water. The Island of Achill, though possessing some merits as a health-resort, has the drawback of a boggy soil, and of a good deal of rain, due to the Atlantic rain-clouds being

attracted by the high mountains in or near it; but between these mountains and the high Croagh Patrick mountain chain further south lies the health-resort which I wish to describe in this paper.

The low hill and plateau of Mullaranny, in the ancient language of our native land, "the hillock of ferns" (*Mulla na Rainea*), is situated on an isthmus a mile wide, which connects the mainland of the County of Mayo with the great Curraun Peninsula, and further west with the Sound and the Island of Achill. This isthmus runs from east to west, and is bounded on the north by the southern termination of Blacksod Bay, which assumes the aspect of a beautiful landlocked and Norway-like fiord; on the south the plateau is washed by the broad Atlantic and the Gulf Stream, pouring into the mouth of Clew Bay. The plateau is about a hundred feet over the sea level; it is of quartzite rock and on a gentle slope, securing a dry subsoil; it faces the south, and consequently enjoys the solar influence all the day. In front of it to the south is a beautiful velvet strand covered at half tide; but this can be crossed by a stone causeway, and the outer sea beach reached, in five minutes. On the north side of the plateau rises the "hillock of ferns," apparently about 200 feet over it; it affords great shelter, it is laid out in winding walks of easy gradient, and provided with numbers of seats commanding lovely views. The shelter of Mullaranny by the neighbouring mountains is complete, and they are near enough to shelter it, and yet far enough to draw the Atlantic rain-clouds, and discharge them without any pluvial infliction upon Mullaranny itself. The ring of shelter is thus comprised—on the north the Nephinbeg range, on the west the mountains of the Curraun Peninsula and the towering Clare Island, on the south (at a distance of nine miles across Clew Bay) the great Louisburg chain and Croagh Patrick,

and on the east the high ground from Newport to Westport. With sea on both sides the air is fresh, stimulating, and abounding in ozone. Between the plateau and the sea runs the public road, which is bordered by a huge fuchsia hedge, which, when I saw it, was abundantly covered with flowers. This hedge is several hundred yards long, about twelve feet high, and four feet thick, and evidently of very ancient growth; and this immense and flourishing specimen of a rather delicate shrub would seem to be a standing testimonial, which cannot deceive, of a long succession of mild, genial winters unbroken by sudden falls of temperature. There is no surer indication of the absence of sudden falls of temperature than the flora of a neighbourhood, and an examination of it bore out the testimony of the great fuchsia hedge. Oleanders and other sub-tropical plants abounded, and the delicate maidenhair fern was growing wild in the clefts of the rocks, just as it does in the great pre-historic fortresses of Aranmore, a little further south.

I now proceed to inquire into the meteorology of the district. I regret that this useful branch of observation is not as carefully pursued in Mullaranny as it should be; still I was able to collect some reliable information. A friend in whom I have every confidence, and who has no motive in misleading, writes as follows:—

“During periods of summer heats we have fogs which during the early mornings obscure and envelop the summits of the neighbouring mountains, but as the day advances they vanish, and leave a clear atmosphere; with this exception we have clear bright skies. Our rainfall comes in heavy showers, which pass off, and leave a clear sky; the ground dries rapidly after rain” (the geological formation of the plateau and its easy slope are enough to prove this statement); “we are not troubled with drizzle or Scotch mist, and murky days are most exceptional.”

I learn through Mr. Myles, C.E., District Engineer to the railway, that the annual rainfall is from 40 to 60 inches, which contrasts well with many favoured English health-resorts; but experience shows that a comparatively heavy rainfall, when the rain comes down in heavy showers, is more favourable to the invalid than a lighter one assuming the forms of long-continued drizzle and mist. I have not been able to obtain any tables of sunshine or sunny days sufficiently reliable to present in this sketch—nothing beyond the general testimony that “Mullaranny is the sunniest place on the coast.”

I am on certain ground in reference to the temperature observations at the neighbouring station of Belmullet, which have been taken for several years (1871–1895) by a reliable local meteorologist, who observes for the Meteorological Office, London:—

	January	July
Mean Dry Bulb Temperature at 8 a.m. -	42·3°	57·5°
Mean Wet Bulb Temperature at 8 a.m. -	41·0°	54·9°
Mean Daily Maximum Temperature -	46·4°	62·2°
Mean Daily Minimum Temperature -	38·7°	53·8°
Mean Daily Temperature -	42·7°	57·7°
Mean Monthly Rainfall -	5·48 in.	3·59 in.

These winter temperatures are in thorough accordance with the fuchsia hedge, and with the flora generally. Meteorological observation at Mullaranny has not extended to the recording of the hygrometric conditions of the atmosphere. The prevailing winds are westerly.

The journey to Mullaranny is an easy one. The voyager can leave Dublin after the usual breakfast hour, and arrive comfortably and without fatigue within a few yards of the hotel in time for a late luncheon. Something must also be said with reference to accommodation, not that the writer desires to “boom” any particular establishment,

but a health-resort without proper residential accommodation is worse than useless. In the Railway Hotel will be found charming grounds commanding fine views over land and sea, electric light, perfect sanitation, and in fact every appliance of the most advanced modern comfort, and for those who do not wish hotel life other fair accommodation is available.

A few concluding words as to the class of diseases for which Mullaranny is recommended. In my opinion it offers a great field for the winter treatment of the early stages of pulmonary consumption, on the modern open-air plan. For chronic bronchitis and pulmonary diseases generally the mild, equable climate presents great opportunities: for the invalid who is able to go about, and who can take a fair amount of exercise, it is very suitable, and for such people there is a variety of walking, driving, or cycling runs through fine scenery on quartzite roads of easy gradient, which are always hard and free from mud, like the well-known Connemara roads. For those who are simply overdone with hard work Mullaranny offers great advantages; and for "week ends" it is very suitable for the healthy recreation of the busy. I shall be glad indeed if this brief account of a place, which will, in my opinion, be one of the great Irish health-resorts of the future, will induce the medical profession to give it a trial. It will be found cheaper and much more accessible than the Riviera, and to the sick perhaps quite as useful.

ON ROOM DISINFECTION, WITH SPECIAL REFERENCE TO FORMALIN VAPOUR AS A DISINFECTANT.

By T. PERCY KIRKPATRICK, M.D. UNIV. DUBL.

[Read in the Section of State Medicine, April 28, 1899.]

IN considering the question of the prevention of tuberculosis, my attention was strongly arrested by the need there was for an efficient yet easily applicable mode of room disinfection. What appeared to me to be most desirable in such a method was simplicity, for there are many ways of disinfecting rooms, clothes, furniture, &c., which are of undoubted efficiency, but they are all of a more or less costly nature and involve considerable trouble in their employment. In the case of tuberculosis, however, what was wanted was a simple process, for the long period over which a case of the disease extends renders it absolutely necessary that any means used for disinfection should be often repeated if it is to be of any service. In cases of acute infectious diseases, such as fevers, &c., one application of the process may be enough, but in tuberculosis something more is wanted.

In view of this, if we examine the methods commonly used, we shall, I think, find that there is much to be desired. We may divide these methods into two great classes:—
(a) Disinfection by means of germicidal gases, or “gaseous disinfection,” and (b) disinfection by means of washing or spraying with germicidal solutions. Of course, we have combined with both these groups the various processes of mechanical cleaning.

The former class would at first sight appear by far the most suitable. It would be merely necessary to generate the gas and leave it to permeate all parts of the room

without further trouble on our part; whereas in the employment of solution every part of the room, as well as every article in it, must be carefully gone over by the operator. Objects which would be injured by water must be removed to be treated by heat or some other method. The advantages of gaseous disinfection, then, are so obvious that we need not wonder at the numerous efforts which have been made to introduce some efficient gas. In the efficiency though lay the difficulty, for a gain in simplicity will not be an advantage if it is made at the sacrifice of efficiency.

An examination of those methods of gaseous disinfection which have hitherto been employed will not show any very remarkable qualities in either of these respects, and in consequence of this their use had well-nigh been altogether abandoned in favour of the other methods.

The three gases which till recently had been most used were sulphurous acid, chlorine, and bromine. With the general public the first has long been the most popular; indeed, we hear of it in Homeric times when Odysseus used it to purify his house after the slaughter of the wooers. Its popularity depends mainly on its powerful smell; for, as regards efficiency, we must rank it lowest of the three. I wish briefly to refer you to some experiments by well-known investigators to show the conclusion which had been arrived at as to the possibility of gaseous disinfection.

First, as regards sulphurous acid, this was tried experimentally by Koch, and his results are very instructive.

The gas was generated by burning sulphur in an iron vessel in the room. He obtained a percentage vol. of the gas, at one hour after setting fire to the sulphur, of 2·89.

After 24 hours this had fallen to 0·02

After 48 hours ,, ,, 0·01

One pound of sulphur to every 1,000 cubic feet, giving 1·1 vol. per cent. of the gas.

Micrococcus prodigiosus and the micrococcus of blue pus after 48 hours' exposure in this atmosphere were found unaffected.

In a further experiment, the percentage vol. of the gas 1 hour after starting was 3·12, and 24 hours after starting it had fallen to 0·015.

From these and other experiments Koch concluded that for the purposes of practical disinfection sulphurous acid is useless. The gas disappears so rapidly that, even when the initial proportion is large, it fails to kill spores freely exposed after being thoroughly moistened. Where it is less in amount, prolonged exposure had no effect on micrococci.

Besides this objection on the score of inefficiency, the gas is objectionable. The smell of the sulphur persists in the room for a long time even with free ventilation, and is very unpleasant. All metal and gilt ornaments, pictures, &c., must be removed or protected from the gas or they will be tarnished. It is evident, then, that little can be adduced in favour of sulphurous acid as a gaseous disinfectant, and we see that it is almost wholly discarded now by the profession.

Let us next examine chlorine. Drs. Fisher and Proskauer have experimented with it and bromine. I quote from their paper on the subject.

By preliminary experiments in an artificial chamber they arrived at conclusions as to the percentage vol. of the gas which it would be requisite to use for disinfection. The gas was generated by the action of hydrochloric acid on chloride of lime, and it was calculated that about $15\frac{1}{2}$ lbs. of chloride of lime was requisite for every 1,000 cubic feet to get the necessary percentage of gas.

It was further found necessary to saturate the air with moisture either by evaporating water in the room or by spraying. It was found also that for practical purposes the gas should be generated from several vessels, and that these should be placed near the ceiling of the room on account of the high sp. gr. of the gas.

Twenty-seven specimens of bacteria were exposed freely under these conditions for 24 hours, and out of this number 22 were killed.

14 out of 15 specimens of earth spores.

2 out of 4 anthrax spores.

2 out of 4 *Micrococcus prodigiosus*.

4 out of 4 *Aspergillus niger*.

The results were not so good when the specimens were sheltered, all surviving except one sample of *Aspergillus niger*. Articles of clothing, &c., which were exposed were found after the experiment to be discoloured, and to be so injured in texture as to be readily torn. We see, then, that though with chlorine most of the bacteria freely exposed were killed, penetration was bad. The conclusion arrived at may be stated in the experimenter's own words. "Complete disinfection of rooms appears, therefore, to be unattainable by means of chlorine. . . . Nevertheless, chlorine may be of great value as a disinfectant in many cases, since it is, at least, capable of destroying all organisms, even the most resistant, which lie on the surface. Hangings, &c., may be removed (for disinfection by steam) and the surfaces either washed with a solution of mercuric chloride or scraped. A preliminary partial disinfection by means of chlorine would greatly lessen the danger of those employed in a subsequent and more thorough disinfection. In all cases where a gaseous disinfectant is needed, chlorine is the best at our command, being superior to either sulphurous acid or

bromine." All hangings, carpets, clothing, &c., must be removed, as chlorine seriously injures them, and metallic surfaces must be protected by varnish or vaseline. The cost of disinfection amounts to about 4d. per 1,000 cubic feet.

When we consider these results it will be obvious to everyone that for the purpose we had in view chlorine was quite unsuitable. It has little or no advantage over the more certain methods in the ease of application, and the difficulties involved in its use quite prevent it ever coming into general employment.

Disinfection by bromine gas is almost entirely prohibited by the cost—1/- per 1,000 cubic feet—and it does not appear to have any advantages over chlorine, except, perhaps, a more uniform diffusion, however, which is compensated for by greater sluggishness.

We are consequently forced to the conclusion that none of the conditions which I postulated as essential for a gaseous disinfectant are fulfilled by those commonly in use. They are not in any case absolutely efficient, nor are they easily used. Of the three, the sulphurous acid is the most convenient, but, as Koch says, it is practically useless. To disinfect with chlorine is perhaps as troublesome as with some of the germicidal solutions, while it is not as efficient. We cannot wonder then that gaseous disinfection fell into disrepute, and was generally neglected. Though we cannot deny the efficiency of the other methods of disinfection, still it is obvious that for the purpose I had in view they were useless. The trouble and expense involved in their frequent use effectually prevents them from helping us here. What was wanted was a simple, cheap means of effecting complete surface disinfection of an ordinary dwelling-room and its contents without damage to any of them. Formaldehyde appeared to be the very thing required, and it was with the object of testing the claims

put forward on its behalf that these experiments were undertaken. The gas is easily generated by means of a lamp or "altformant," sold at a moderate price by Messrs. Zimmermann. This apparatus is perfectly simple in structure. It consists of a hollow tin cylinder, at one end of which is a reservoir with lamp for burning the methylated spirits, while into the other end fits a metal chamber for holding the paraform tabloids. The action of the products of combustion of the spirit on the paraform is to convert it into formaldehyde in a gaseous state. This gas CH_2O has, it is said, a sp. gr. almost equal to that of the air, so that it diffuses rapidly to all parts of the room. While possessing a powerful germicidal action, the gas has no injurious effects whatever on fabrics, metals, &c., consequently it is not necessary to remove anything from the room in which it is used. When undiluted it has a powerful and penetrating odour, and is irritating to the mucous membrane of the nose and conjunctiva, but it does not appear to be poisonous to animals.

It is claimed for the gas that it is a deodorant and germicide of great power, and that it has considerable power of penetration into clothes, &c. It is very easy to manipulate, safe and not costly, so that if it can be shown to be efficient it would appear to be an ideal disinfectant. The penetrating smell, which, I may remark, rapidly disappears on dilution with air, further recommends it to the public; for it is, as I said before, by means of their noses that the public generally estimate the value of a disinfectant. A vast quantity of literature has already accumulated about the uses of formaldehyde, and many experiments have been undertaken to test its efficiency as a germicide. Perhaps I may be permitted to bring a few of the more recent of these to your notice before passing on to those made by Dr. Littledale and myself. Drs.

Fairbanks and Grawitz, of the City Hospital, Charlottenburg, Berlin, used for their experiments an ordinary sleeping-room of 3,213 cubic feet capacity, or 93·6 cubic metres, and diffused 1 gramme of formaldehyde to every cubic metre, or 1 tabloid to every 35 cubic feet. The room was closed for 50 hours, and various cultures were exposed—

- (a) Anthrax exposed freely at various heights. All remained sterile, and were injected into mice without any ill results.
- (b) Anthrax exposed between bits of cloth on the floor showed no sign of growth.
- (c) Anthrax exposed as in (b), but placed between two mattresses, showed abundant growth after 20 hours.

Bacilli of diphtheria and typhoid fever and staphylococci freely exposed gave no growth.

The surface of the dust appeared sterile, but showed growth of bacteria in its deeper parts. Tubercular sputum dried in vacuo and exposed in a glass vessel for 30 hours was then rubbed up with sterilised water and injected into guinea-pigs without any ill result. Control experiments gave positive results with guinea-pigs.

The conclusions which we appear to be warranted to draw from these experiments and from numerous others by different observers appear to be that, while the disinfectant action on the surface of objects is very efficient, its penetrative power is not very marked—in other words, formaldehyde has as great disinfectant powers as the best of the gases hitherto used, if not greater, while it is free from many of the objections to which the others were open.

If we compare these results with those to be detailed by Dr. Littledale, we shall, I think, find the same general result, though in his case the quantity of gas was not so

great (about $1\frac{1}{2}$ tabloids to every 100 cubic feet), nor was the exposure so long (9 hours). The experiments with the pus-smeared gauze and with the sputum on the cover glass are very interesting, showing as they do the powerful germicidal action of the gas on the surface of such objects.

It may be objected that the formaldehyde was present in the exposed objects when they were inoculated on the culture media, and that in consequence, though growth was prevented, we are not warranted in assuming that the micro-organisms were dead. The answer to this is, that when the inoculation was made on fluid media, where the gas could easily disperse, the results were the same. I believe this objection may have some force when solid media are used, and may perhaps explain the various results obtained by different experimenters.

We are, I think, justified in concluding that in formaldehyde, generated as I have described, we have a most useful adjunct to our disinfectants. In efficiency it may not perhaps reach our ideal, still it possesses more of those characteristics which go to constitute that ideal than any other of the gases; and while this is so, it is equal, if not superior, in efficiency to any of them. As regards ease of manipulation, it far surpasses them all, while its safety is all that could be desired.

I firmly believe that great benefit will be derived, both by patients and attendants, from its regular use in the homes of the tubercular. We must gladly welcome every additional means to combat the spread of this dreadful disease, since those at our disposal are so inadequate, and especially will we welcome one which appeals to our reason as logical, and the claims of which have answered the test of experiment.

EXPERIMENTS ON FORMALIN VAPOUR AS A ROOM DISINFECTANT.

BY H. E. LITTLEDALE, M.B.;

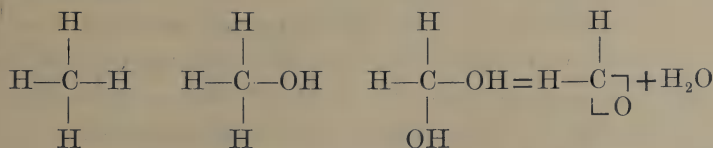
Assistant in the Pathological Laboratory, Trinity College, Dublin.

[Read in the Section of State Medicine, April 28, 1899.]

By the kind permission of the visiting staff of Sir Patrick Dun's Hospital we were able to carry out our investigations, and Dr. Haughton kindly placed at our disposal his X-ray developing room. This room is a small one of about twenty-eight cubic metres content, with no opening into it except the door, which fits very tightly, and a ventilator over it, which was hermetically closed before the experiments. Opposite the door there is a table, on which the altformant lamp was placed, and ten grammes of formalin tabloids were vaporised by heat. The door was closed tightly, and all crevices plugged with tow; and at the end of nine hours the door was opened, and the various test objects were placed in nutrient media.

As to the nature of formalin, it is a 40 per cent. solution in water of formic aldehyde.

Aldehydes are hydroxyl substitution products of the hydrogen in hydrocarbides, and formaldehyde is the simplest of the series.



Methane.

Methyl-alcohol.

Formaldehyde and Water.

In order to test whether the formalin vapour, generated as described, was really an efficient disinfectant and capable of destroying bacteria when exposed to it, experiments were

undertaken in such a way as to copy the conditions usually present when one has to disinfect a room after, *e.g.*, diphtheria or scarlatina.

Several species of bacteria grown in different media were exposed in different ways, to be described later on. The following is a list of these bacteria:—

(1.) An emulsion of the common yellow coccus of the air made in boiled water, the coccus having been grown on gelatine.

(2.) A similar watery emulsion of a mixture of *Bacterium coli commune* and *Staphylococcus pyogenes albus* which had been grown together on an agar tube.

(3.) A pure culture of the typhoid bacillus growing actively in bouillon.

Besides these known bacteria, objects containing a mixture of unknown bacteria were also used. These were:—

(1.) Sputum from a case of cirrhosis of the lung, dried on cover glasses in an oven at 37° C.

(2.) Fresh gonorrhoeal pus, smeared well into small pieces of plain unsterilised gauze.

(3.) A gelatine plate, on which were growing numerous bacteria out of putrid urine, some of which, however, had been specially marked, and proved to be a *Micrococcus ureæ non-liquefaciens*.

(4.) Dust from the wall of the room where the experiments were going to be made.

To expose the bacteria in the watery emulsion form would have been useless as a practical test for a gaseous disinfectant, so they had to be brought into a dry state in order that the vapour might be able to act on them.

In order to do this, clean silk threads, which were not sterilised, were cut up into small pieces about half an inch long and laid in watch glasses that were also just ordinarily cleaned with boiled water and dried over a flame. Several

drops from each of the liquid test objects were then poured over them, and they were left for about ten minutes to soak well. They were then taken and wrapped in pieces of clean, but unsterilised, filter paper, so that one had several little loosely-folded packets of threads, soaked in typhoid bouillon, in an emulsion of *Bacterium coli commune* with *Staphylococcus pyogenes albus*, and in an emulsion of the air yellow coccus, and, added to these, there were also the cover glasses of dried sputum and the pus on gauze, which, however, was not quite dry when the experiments were started.

Tubes of nutrient media, inoculated just before the experiment, were also used as tests.

Three test tubes containing a sloped agar surface, and two containing sloped blood serum, were prepared in the following way:—

One agar tube, 12·5 cm. long by 1·5 cm. wide, was smeared with a mixture of *Bacterium coli commune* and *Staphylococcus pyogenes albus*, taken from an agar tube, on which they were growing together, the length of the smeared surface being 6·5 cm. from the bottom of the tube. A second agar tube, exactly the same measurements and smeared to the same extent with the same bacteria. Control tubes of both these were made.

One agar tube, 15·75 cm. long and 1·5 cm. wide, smeared with a pure culture of typhoid over an extent of surface 7 cm. from the bottom of the tube.

Two blood-serum tubes, 15·5 cm. long and 1·5 cm. wide, smeared with dust from the room over an extent of 4 cm. from bottom of the tube.

The tubes were all left open on a table in the room, on the same level as the gas generator and four feet away from it. One of the agar tubes containing coli and coccus was inverted, and one of the serum dust-smeared tubes kept as a control.

The three control tubes were put into the oven at 37° C., and kept there for twelve hours, after which time they all showed a most luxuriant growth the entire length of the smear.

When the experiment was over—that is, after the test objects had been nine hours exposed to the gas—the tubes were left till all smell of formalin vapour had left the room, then their wool plugs were reinserted, and they were placed in the oven at 37° C.

The blood-serum tube smeared with dust grew over the whole extent of the smeared surface, that is, 4 cm.; so the vapour was apparently unable to penetrate at all events any further than 11.5 cm. into the tube with efficient action.

The agar tube, 12.5 cm. by 1.5 cm., smeared with coli and coccus mixture over an extent of 6.5 cm., showed, after twelve hours at 37° C., a marked growth for 5.5 cm., which terminated in a sharply-defined horizontal line; so the vapour apparently penetrated the tube 7 cm. in an efficient manner, as even after five days at 37° C. no further growth above the transverse line took place.

The inverted tube grew over a distance of 4.5 cm., terminating abruptly just as the previous one; but the vapour appears in this case to have had a more penetrating action when ascending the tube than when descending it, as in this case it penetrated 1 cm. further into the tube. No further growth above the line after five days at 37° C.

The agar tube, 15.75 cm. by 1.5 cm., smeared for 7 cm. with typhoid, grew, after fourteen hours at 37° C., over a distance of 3.75 cm., but no further even after weeks; so the vapour penetrated efficiently in this case to a depth of 12 cm.

The gelatine plate of urine bacteria was exposed open on a shelf several feet away from the gas generator, and about four feet above it. It was then covered and removed, and a colony of *Micrococcus ureæ non-liquefaciens* was picked off

next day, and smeared on a fresh gelatine plate. No trace of growth took place even after four days on the fresh plate.

The threads, dried sputum, and pus-smeared gauze were exposed in the following ways:—

Several threads soaked in the air yellow coccus emulsion and let dry were exposed open in a watch glass on top of the experiment room door high above and far away from the generator. After the nine hours exposure they were embedded in gelatine that was semi-solid in a Petri dish, and kept at room temperature in September. These showed no trace of growth after five days.

Threads steeped in typhoid bouillon and let dry, were loosely wrapped in filter paper and placed in a piece of lint loosely folded and laid on a table near the generator. These embedded in gelatine showed no sign of growth after five days.

Threads steeped in *Bacterium coli* and *Staphylococcus pyogenes albus* were placed in filter paper loosely folded, and put into the middle of the Medical Directory. They also were sown on gelatine and showed no growth after two days, so one thread was transplanted on to agar and put in the oven at 37° C., where a most luxuriant growth developed after twelve hours, and at the end of three days colonies of both the coli and staphylococcus began to develop in the gelatine, and after five days the growth was profuse, the coccus beginning to liquefy the gelatine.

Threads of yellow air coccus emulsion dried and wrapped in blotting-paper, and then hung up in the pocket of a coat near the door. These were embedded in gelatine, but showed only a few minute colonies beginning to develop at the end of five days.

Threads in coli and *Staphylococcus pyogenes albus* emulsion wrapped dry in filter paper and left on the table near the generator embedded in gelatine showed no trace of growth after five days.

Threads in yellow coccus emulsion dried and wrapped in filter paper, were placed in a watch glass on the floor in a corner of the room. Embedded in gelatine showed copious growth after two days.

Threads soaked in typhoid bouillon, dried and wrapped loosely in filter paper and then in lint, left on the table. These were dropped into bouillon and kept at 37° C., but showed no trace of growth after five days.

Threads in coli and staphylococcus emulsion dried, wrapped in filter paper, and hung up in the pocket of a coat near the door. Placed in bouillon, and kept at 37° C., showed a luxuriant growth and complete turbidity of the bouillon after twelve hours. Other similar threads to these exposed open in a watch glass on the table, then transferred to bouillon at 37° C., showed no trace of growth after five days.

Typhoid bouillon dry threads exposed open in a watch glass transferred to bouillon, showed no growth at 37° C. after five days.

Cover glass smeared with sputum and dried in the oven at 37° C., exposed open on a table, then transferred to bouillon and kept at 37° C., showed no trace of growth for three days, but on the fourth day the bouillon became quite turbid, due to the presence chiefly of a micrococcus. A control cover glass showed, under similar temperature conditions, a copious growth after twelve hours.

Two pieces of gauze smeared with gonorrhœal pus, one kept as a control, were partly dried, and the control put into bouillon, which became thickly turbid with numbers of different bacteria after twelve hours at 37° C. The other piece partly dry, exposed open on the table, and then transferred to bouillon at 37° C., showed no trace of growth for three days, but on the fourth day the surface of the bouillon was coated with a thin skin, which consisted of long threads of some form of leptothrix, but no other bacteria were present.

Control tests in bouillon of all the thread objects experimented with, showed copious growth after twelve hours at 37° C. These, then, are all the test objects exposed, and the results of the exposure. When I entered the experiment room nine hours from the time the experiments were started, the smell of formalin in the room was not very strong, and I was able to stay in the room, leaving the door open, though it was very unpleasant; the lamp was out, and there was nothing left of the tabloids in it. After leaving the door open for fifteen minutes, I started inoculating the tubes, &c., in the manner described after nearly all smell of formalin had gone.

Now let us consider what practical results we have got from these experiments. To begin with, they were undertaken under conditions far more favourable to the action of the disinfectant than one ever meets in actual practice. The room was a small one, with absolutely no opening into it except the door, which fits very tightly, and which was made more resistant to the escape of the gas by plugging the key-hole and underneath the door tightly with tow. Again, the bacteria were exposed more or less openly, not buried in dust or lying in crevices, or in the middle of bundles of clothes, &c.

The experiments with the tubes which were inoculated and exposed openly are of especial interest, as they show that the vapour seems only capable of penetrating a tube efficiently for a certain distance, and what is more strange, its action ceases abruptly; but the actual distance of efficient penetration of the vapour for tubes of the same diameter is not constant, and it probably depends on the degree of resistance offered by the bacteria; still it is hard to explain in this way the sharply-defined termination of penetration as determined by the growth of the micro-organisms. Further, for the same bacteria the vapour seems to have a greater penetrative power where the tube is inverted than where it is

erect. As regards the other test objects, it will be noticed that all the bacteria exposed open to the formalin vapour were killed with the exception of the threads of yellow air coccus, which were put under a table in the very corner of the room. These latter, however, were not quite openly exposed, as they were wrapped loosely in filter paper. All the threads which were protected from the vapour, as, for instance, those hung up in a coat pocket, were very slightly or not at all affected by the vapour, the only exception to this being the typhoid threads which were wrapped in paper and covered with several folds of lint.

The experiments with the sputum on cover glasses show that the vapour killed the surface bacteria, but when the surface layer had dissolved off in the bouillon, a condition easily recognised by the shaggy appearance of the smeared surface, then the bacteria in the deeper layers grew quite freely. In the case of the pus gauze, however, everything except a leptothrix was killed. All these experiments go to show that formalin, as a superficial disinfectant, is most useful, but its power of penetration is very slight. The results of a number of experimenters in Germany are quite in agreement with ours.

Dr. Gehrke, Assistant in Loeffler's Institute at Greifswald, published in the *Deut. med. Woch.*, No. 15, of last year, experiments which he conducted with Schering's lamp. He used in his experiments much stronger formalin, vaporising two grammes of trioxymethylene—that is, solid formalin pastilles—for every cubic metre. His results, however, were exactly like ours, as he found that protecting the test objects somewhat as we did was quite sufficient to prevent the gas getting at them; and, moreover, the inoculated tubes which he exposed gave exactly the same peculiar result.

Gemünd's experiments in Munich, with the same apparatus and under similar conditions, also gave results similar to Gehrke's.

Valagassa states that by using Trillat's apparatus, and developing the gas under 4 atmospheres' pressure, tubercle and diphtheria bacilli, in layers of sputum 2-3 mm. thick, are quite killed.

Petruschky exposed objects for one hour to vapour generated at 33 atmospheres, going down to two, in Trillat's apparatus, and got very good results, but failed to kill anthrax spores concealed in the toe of a boot even after leaving the gas, generated for one hour, to act for twenty-four hours after. His results with inoculated tubes were precisely the same as ours and Gehrke's.

Perhaps the most thorough experiments have been those of Elsner and Spiering, in Berlin Hygienic Institute. They tested a number of generators, but obtained far the best results with an apparatus of Schlossman's. This apparatus works by generating formalin gas, mixed with steam and also glycerine, to prevent polymerisation.

Schönfeld, of Mannheim, corroborates the experiments of the two former with Schlossman's apparatus, and he makes the interesting remark that rabbits are not affected when left in a room where formalin is being generated from a Schering's lamp, while they are killed by the glycoformal steam of Schlossman's generator.

DR. NINIAN FALKINER, reviewing the action of chemical disinfectants, said they acted in three ways—by “oxidation, direct or indirect,” “reduction,” or by “coagulation of albumen.” Referring to the manner in which the disinfecting action of the formalin vapour stops at a clearly defined line in the culture tube, it suggests that the limit was caused by a chemical change in the vapour itself, produced by its action as a chemical oxidiser, it being reduced to the condition of an alcohol.

DR. KNOTT was inclined to believe that the stoppage of penetration at a certain line in the culture tube was due to eddying currents generated by the disinfectant, and that the explanation was physical rather than chemical.

DR. H. C. TWEEDY said that anyone working much among the poor knew the great objection they had to disinfection as carried out at present; a more effective and less disagreeable process was, therefore, much to be desired.

DR. LITTLEDALE, replying, said the penetrating action of the vapour appeared to be inversely proportional to the vitality of the bacteria—a point which seemed to favour the suggestion made by Dr. Ninian Falkiner. Their experiments had not given formalin an exhaustive trial, as they had used a very weak gas.

DR. KIRKPATRICK pointed out that amongst the advantages which formalin had over other gaseous disinfectants was the ease and rapidity with which it could be used. The result did not depend so much on the length of time objects were exposed to the gas, but rather on its initial force. Six or seven hours would be sufficient to thoroughly disinfect with this vapour, and on opening the doors and windows after this the smell at once disappeared, which was not the case with sulphurous acid or other gaseous disinfectants.

SECTION OF ANATOMY AND PHYSIOLOGY.

THE SENSORY DISTRIBUTION OF THE FACIAL NERVE IN MAN.

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[Read in the Section of Anatomy and Physiology, February 3, 1899.]

THE study of the connections of the seventh and ninth cranial nerves with one another and with the fifth nerve in man, has led to one of the most complicated and difficult descriptions to be found in text-books of human anatomy. In many cases a description of these nerves, based upon a rash attempt to establish a manifest similarity in the connections of the various sympathetic ganglia of the head, has added to the confusion; and as the same nerve may receive different names in various parts of its course, the description is often rendered more obscure than is necessary. Our knowledge of the subject can hardly be considered to be in a satisfactory state as long as an almost equal amount of importance is attached to all connecting branches, whether large or small, constant in occurrence or otherwise, irrespective of the functions which they perform. If we admit that importance lies, not in the fact that two nerves are known to communicate, but rather in a knowledge, or conjecture, of what happens in such communication—that is, which nerve receives fibres from the other—we must regret that, with all their minute accuracy of detail, so many of the ordinary text-books of anatomy and physiology leave the real interest of the matter almost untouched.

It must be admitted that formerly, omitting the results obtained by experiments on lower animals, and by observations in cases of disease, no information regarding the functions of many of the smaller branches or connections of the cranial nerves could be obtained. Within recent years, however, an increase in our knowledge of their mode of development in man, as well as the study of their development and permanent condition in lower forms, has led to the hope that a simpler and more scientific description of these cranial nerves and their chief connections may be substituted for the present elaborate but confusing accounts. It will be found that such studies in embryology and comparative anatomy will not only show what we may assume to be the functions of the various branches and connections of these nerves, but will also enable us to distinguish between those branches and connections which are primary, or first formed (these are apparently alone represented in lower forms), and those which are acquired later, and are more inconstant.

Thanks to the wide-reaching discovery of Professor His—that afferent nerve fibres arise in the embryo as processes of the cells composing the ganglia, while efferent ones are outgrowths from cells within the medullary tube—we possess a useful and certain method of distinguishing between these two great classes of nerve fibres. Not only can we thus determine the functions of many nerves, but we are also enabled to say, from a study of their mode of development, which nerve receives fibres from another where a communication takes place between two nerves or their branches. It is further satisfactory to find that results obtained in this way, in the case of the cranial nerves in man, are borne out by what is known of the conditions of the nerves in lower animals, and are not contradicted by the most reliable pathological and experimental evidence.

To appreciate the difficulties of the subject, as it has been presented by text-books of anatomy and physiology, one has only to study such elaborate works as those of F. Krause¹ on trigeminal neuralgia, and observe the great difficulties he labours under in an attempt to explain his results by reference to published descriptions of these cranial nerves, their branches, and connections. In fact, no one description which he quotes is sufficient to explain the results, obtained in his cases, of removal of the fifth nerve roots.

Until quite recent years very many physiologists, pathologists, and anatomists have regarded the seventh as a purely efferent nerve, supplying the facial and certain other muscles as well as providing vaso-dilator fibres for the submaxillary and sublingual glands. Such authorities have either made no mention of afferent fibres in connection with the seventh,² or having recognised taste fibres in the chorda tympani, they have referred these afferent fibres to the fifth or ninth nerves.³ The afferent fibres are by these authors supposed to reach the seventh by the great superficial petrosal nerve, or by the nerve of Jacobson (small superficial petrosal), and therefore not to be true fibres of the facial itself. Within the last few years human anatomists have been more and more drawn to the idea that the facial has not only a mixed efferent and afferent distribution, but that the nerve itself is really a mixed nerve, like the trigeminal or ninth nerves, its afferent fibres not being derived from other cranial nerves. They have been led to recognise in the chorda tympani the peripheral distribution of the afferent part of the facial, and in the pars intermedia, with its geniculate ganglion, the afferent root of the nerve. That the fibres of the pars intermedia are continuous with those of the chorda tympani is evidently a fact accepted by the authorities who are responsible for *Die Anatomische*

Nomenclatur,⁴ as in this list the name "chorda tympani" is placed under that of "nervus intermedius." It is curious that the name "ganglion geniculi" is not also placed under the same nerve instead of being mentioned in the list of the various motor parts of the facial.

Professor His⁵ and others have for many years insisted on the mixed nature of the seventh nerve in man; and those anatomists who have overlooked the afferent fibres of the nerve can only have done so from putting too much confidence in supposed conclusive physiological and pathological evidence. It is surprising that so many text-books still hesitate to state emphatically the mixed nature of the seventh nerve in the manner in which, for instance, they speak of the fifth and ninth nerves. Professor van Gehuchten,⁶ it is true, in a decided manner separates the efferent and afferent portions of the facial; indeed, he goes so far as to describe the afferent fibres as composing a sensory nerve—the *nervus intermedius*—distinct from the "facial," which is a purely motor nerve. Professor Gegenbaur⁷ also draws attention to the mixed nature of the seventh nerve. In his text-book he says:—"Der Nerv führt von seinem Ursprunge an motorische und secreteurische Fasern, sensible treten, wie es scheint, durch die *Portio intermedia* hinzu;" and under the description of the geniculate ganglion we find, "In dieses Ganglion geht vorzugweise die *Portio intermedia* ein, die man deshalb auch als Äquivalent einer hinteren Wurzel auffasste." In describing the *chorda tympani*, he notes the taste fibres present in it, and says these either reach the *chorda* from the *glosso-pharyngeal* or they come from the *portio intermedia*. Professor Gegenbaur seems to incline to the latter view.

In Professor Thane's⁸ description of the cranial nerves we find no distinct mention of afferent fibres in the facial

until we come to the very useful summary, given after the description of each nerve, where in the case of the seventh we find:—"It (the facial) also furnishes, through the chorda tympani, secretory and vaso-dilator fibres for the submaxillary and sublingual glands; the same nerve would appear to contain the taste fibres from the fore part of the tongue." These afferent fibres in the chorda tympani are also noted in the chapter on the "Morphology of the Nerves," in the tables showing "the constitution of the cranial nerves" and "the segmental nerves of the head." In the latter table we have also a notice of the "afferent part" of the portio intermedia. On the other hand, in the same chapter, under the heading "Course and Distribution" no mention is made of the sensory distribution of the facial, although the branch of the fifth nerve to the part of the tongue developed from the tuberculum impar is noticed. Of the geniculate ganglion, we are told that its cells resemble those of a spinal ganglion, that it is mainly connected with the portio intermedia, and that "the fibres which proceed from its cells (both proximally and distally) are probably afferent." We also read that according to many observers the chorda tympani is, in large part at least, continuous with the portio intermedia. We miss, however, in Professor Thane's description, the clear statement—such as is made, for instance, in the case of the fifth nerve—that the facial is a partly motor partly sensory nerve.

Most of the other English text-books of anatomy,⁹ physiology, and pathology ignore or attribute to other sources the sensory fibres of the true facial.

Some time ago, as a result of embryological studies, I drew attention to the fact that the chorda tympani and great superficial petrosal nerves of mammals must be looked upon as true branches of the facial nerve,¹⁰ and I

have further attempted to show that the results of intracranial operation on the fifth nerve roots completely disprove the idea that the sensory (taste) fibres of the seventh are derived from the course of the fifth nerve, and prove incidentally the partly sensory nature of the facial.¹¹ As we have seen above, the fact that the chorda tympani is a sensory branch of the true facial is at present more or less completely recognised by many recent text-books of human anatomy. Up to the present, however, no text-book of human anatomy with which I am familiar urges that the great superficial petrosal nerve in man is a sensory branch of the facial nerve, although a study of its development clearly shows that it arises as such. The more usual accounts of this nerve ascribe to it two kinds of fibres—motor fibres, passing from the seventh nerve to the ganglion of Meckel, and sensory fibres, coming from the course of the fifth nerve into that of the seventh. According to Professor Thane, for instance, the nerve conveys “fibres from the facial (or portio intermedia) to the spheno-palatine ganglion,” and “others derived presumably from the fifth nerve, which run distally in the facial trunk.” The destination of these latter fibres, which are mentioned on the authority of Penzo, is not stated. The great superficial petrosal nerve is, according to Professor Thane, an “efferent splanchnic” nerve, like the “efferent part of the chorda tympani.” In his summary of the facial nerve he notices that, according to some, the great superficial petrosal supplies the azygos uvulæ and levator palati muscles.

Other authors simply describe this nerve as the motor root of the spheno-palatine ganglion, and we often find it, on the other hand, described under the fifth nerve. It is mentioned in *Die Anatomische Nomenclatur* among the branches of the spheno-palatine ganglion. Professor

Gegenbaur¹² describes the great superficial petrosal as carrying motor impulses from the facial nerve to the spheno-palatine ganglion, and he considers it a matter of doubt whether sensory fibres are conveyed by it from the fifth into the course of the seventh. Professor Macalister's view is somewhat similar. Professor van Gehuchten does not consider the great superficial petrosal nerve a branch of the "nervus intermedius" or sensory part of the facial, but describes it together with the motor seventh. He is evidently, however, not satisfied about the nerve, for he says that although it is generally supposed to carry motor fibres from the seventh nerve to the ganglion of Meckel, for the supply of the levator palati and azygos uvulæ muscles, experiments have shown that these muscles are supplied by the tenth cranial nerve. There never seems to have been much direct evidence to show that the levator palati and azygos uvulæ muscles were supplied by the seventh nerve, and pathologists are now, for the most part, agreed that these muscles are innervated from other sources. The motor functions of the great superficial petrosal nerve have been assumed in many cases by anatomists in order to provide a "motor root," or more recently "splanchnic efferent" fibres, for the spheno-palatine ganglion. Pathological and experimental observations at present afford no evidence of motor fibres in this nerve, and embryological evidence is entirely in favour of the nerve being a sensory branch of the facial (or portio intermedia).

If further evidence in favour of the afferent nature of the great superficial petrosal nerve were wanting, it is to be found abundantly in what is known of the distribution of the afferent part of the seventh nerve in lower animals. Within the last few years comparative anatomists have been enabled to show that a very complete correspondence exists in the distribution of the facial nerve and its

branches among the various classes of animals, from fishes to mammals.¹³

For a long time the fusions which often take place in different groups of animals between, for instance, the seventh and fifth nerves, or between the true seventh nerve and certain nerves of the system of lateral line sense organs, had prevented such correspondence being fully recognised. The accurate study of a large number of adult types and the accumulation of much careful observation has now resulted in the satisfactory isolation, in lower animals, of the nerve corresponding to the facial nerve in man. The true facial nerve in the different classes of fishes has been shown to have a distribution corresponding in a very remarkable manner to that of the ninth nerve and to that of each of the subdivisions of the tenth nerve (see Fig. 1). Each of these nerves passes from its superficial origin at the brain to the dorsal limit of one of the gill clefts. In this position it comes into relation with a ganglion, and the nerve divides into two main branches, both of which pass ventrally, one in the arch in front of (cephalic to) the cleft, and the other in the arch behind (caudal to) the cleft. In the case of the seventh nerve, the cleft to which it is thus related is the spiracle. The branch in front of the cleft has received the name "pre-spiracular" or "internal mandibular" nerve, and lies in the posterior part of the mandibular arch, which it follows towards the ventral line. The branch behind the spiracle, on the other hand, is called the "post-spiracular" or "hyo-mandibular" nerve, and lies in the hyoid arch.

In addition to the branches which lie in the gill arches, each of the nerves above mentioned gives off a branch which passes inwards towards the dorsal aspect of the alimentary tube. In the case of the facial, this latter branch has received the name of "palatine nerve."

Huxley,¹⁴ Balfour,¹⁵ and many more recent writers¹⁶ have pointed out that the pre-spiracular (mandibular or internal mandibular) nerve is the homologue of the chorda tympani of higher animals, and that the palatine branch most probably corresponds to the great superficial petrosal nerve. In fishes, the pre-spiracular is manifestly a branch of the seventh nerve; it need not apparently communicate with the inferior divisions of the fifth nerve, but it supplies branches directly to the mucous membrane of the floor of the anterior part of the pharynx in the region where the



FIG. 1.—Diagram to illustrate the mode of distribution of the fifth, true facial, ninth and tenth cranial nerves in "water-breathing" Anamnia. (Modified from Wiedersheim's Comparative Anatomy of Vertebrates, adapted from the German by W. N. Parker.)

Lettering common to Figs. 1, 2, and 3.

V.—Trigeminal nerve.

VII.—Facial nerve.

VIIa.—Palatine or great superficial petrosal branch of the facial nerve.

VIIb.—Pre-spiracular, mandibular, or chorda tympani branch of the facial.

VIIc.—Post-spiracular or motor portion of the facial nerve.

IX.—Glossopharyngeal nerve.

IXa.—Palatine branch of glossopharyngeal, or nerve of Jacobson.

X.—Vagus nerve.

S.—Spiracle or ear cleft.

1-5.—Gill clefts.

Max.—Superior maxillary division of the fifth nerve.

Mand.—Mandibular division of the fifth nerve.

Ling.—Lingual nerve.

tongue is developed in higher forms. The palatine branch does not necessarily communicate with the superior maxillary nerve, but supplies twigs to the roof of the mouth. Both these nerves, pre-spiracular and palatine, are afferent branches of the facial, connected with the ganglionic root of that nerve. The post-spiracular, on the other hand, is an efferent nerve, like the main trunk of the facial in man, and supplies, just as that nerve in man, the muscles developed in connection with the hyoid arch. The only marked difference between the condition of the true facial nerve in the lower gill-breathing vertebrates and that of the facial in man is, that in man the afferent fibres of the chorda tympani

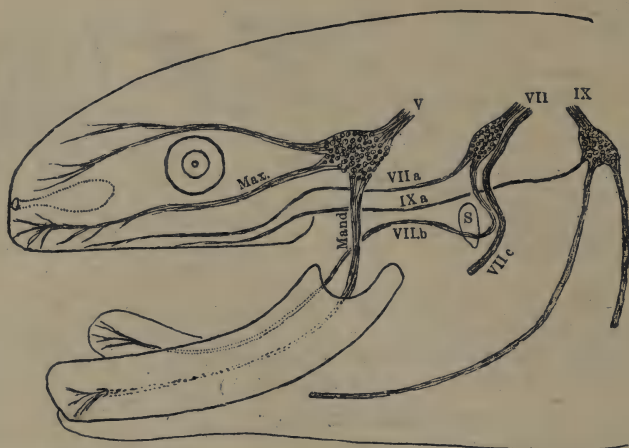


FIG. 2.—Diagram to illustrate the mode of distribution of the fifth facial and ninth cranial nerves in lower "air-breathing" Vertebrates. (Modified from Wiedersheim's Comparative Anatomy of Vertebrates, adapted from the German by W. N. Parker.)

or pre-spiracular branch, at first follow the course of the post-spiracular nerve; they soon leave this, however, and, arching forwards across the tympanum (which developmentally represents the spiracle), they enter the mandibular arch. In typical fishes, on the other hand, both pre-spi-

racular and palatine nerves take origin together from the ganglion, which represents the geniculate ganglion of man. In lower air-breathing vertebrates the same branches are to be recognised, and it is most interesting to find that the palatine and internal mandibular branches are here again afferent, while the hyo-mandibular is efferent. There is thus a complete correspondence in the typical mode of distribution of the facial nerve and its branches in the vertebrate series with what we must infer from embryological and experimental evidence to be in the case of man.¹⁷ Compare Figures 1, 2, and 3.

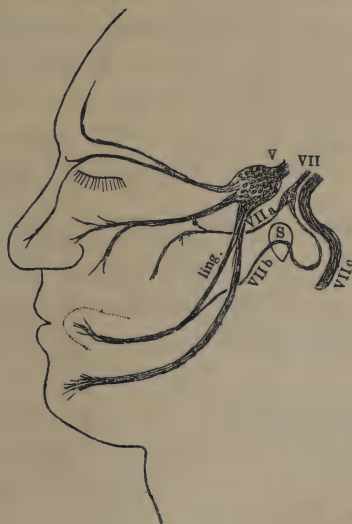


FIG. 3.—Diagram to illustrate the sensory distribution of the facial nerve in man. (Compare with Figs. 1 and 2.)

We must here, however, note that the histological observations of v. Lenhossek¹⁸ in the mouse do not bear out the conclusion that the great superficial petrosal is an afferent branch of the seventh cranial nerve. His preparations, made by Golgi's method, show numerous fibres continued

directly from the seventh (or possibly from the nervus intermedius) into the great superficial petrosal through the geniculate ganglion, these fibres being unconnected with the cells of the ganglion. Concerning the great superficial petrosal nerve he concludes—"Über die Natur dieses Nerven, ob sensibel oder motorisch, geben meine Bilder natürlich keinen unmittelbaren Aufschluss. Die gangbare An sich geht bekanntlich dahin, dass der N. petr. superf. major einen echten motorischen Nerven, einem Ast des N. facialis darstellt und man hat ihm sogar die Innervation des M. levator veli palatini und levator uvulæ zugeteilt, auf Grund der bekannten anatomischen Forschungen von Bidder . . . u. A. Vom histologischen Standpunkte muss der motorische Character des Nerven in der That als sehr wahrscheinlich bezeichnet werden." We have seen above, however, that recent observations show that these muscles of the soft palate are not supplied through the great superficial petrosal, from the seventh nerve, and also that, embryologically, the fibres of the great superficial petrosal nerve spring from the cells of the geniculate ganglion. From this it would seem that the fibres described by v. Lenhossek can at most form a small part of the great superficial petrosal nerve.

The idea that the great superficial petrosal nerve of mammals is a motor nerve is accepted by Professor Gegenbaur,¹⁹ and prevents him homologising that nerve with the palatine branch of amphibia and fishes. As we have seen, Professor Gegenbaur describes the great superficial petrosal as the nerve supply for certain of the muscles of the soft palate.

Dr. Gaskell's²⁰ observations must also be mentioned here. This author looks upon the nervus intermedius in man, and the corresponding bundles of fine fibres in the seventh nerve of the dog, as "efferent splanchnic" in function. He

describes, however, a few large fibres which stand out conspicuously among the smaller ones of the nervus intermedius, and remarks, "I draw attention to this fact (the presence of these large fibres) simply because it is possible that further investigation of these larger fibres may throw light upon the vexed question of the existence of nerves of taste in connection with the seventh nerve." Dr. Gaskell considers that the geniculate ganglion represents a "vagrant efferent ganglion of the same kind as the oculomotor ganglion," but says, "it may, however, be more than this, for I have not been able as yet to convince myself that it is free from connection with any group of large fibres as is the case in the latter ganglion."

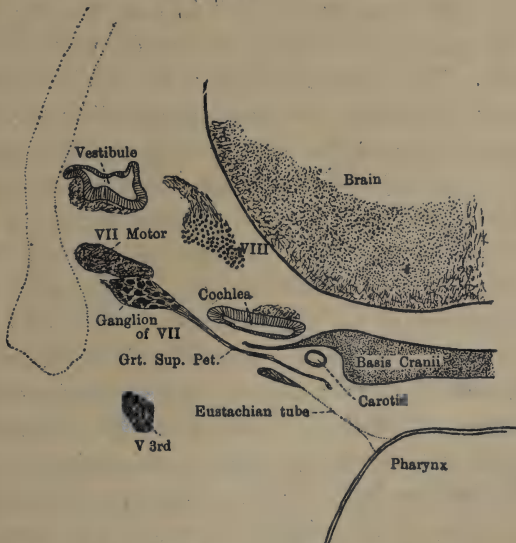


FIG. 4.—Outline of part of a horizontal section through the head of a rat embryo, to show the origin of the great superficial petrosal nerve from the cells of the geniculate ganglion of the facial nerve.

Embryological and anatomical investigations have, however, shown that the geniculate ganglion of the facial is a very different structure from the ciliary ganglion. The

latter is developed at a relatively late period, and is made up of multipolar nerve cells, while the geniculate ganglion appears early, and is composed of cells resembling those of a spinal ganglion. The fibres of the afferent branches of the facial nerve (as can be seen very readily in the case of the great superficial petrosal branch, Fig. 4) and those of the afferent root grow out from the cells of this ganglion. The root fibres can be traced into the wall of the neural tube, where they form a longitudinally running tract, just, as happens in the case of other afferent nerves.²¹ Since the geniculate ganglion corresponds in this manner to the ganglion of a posterior nerve root, we do not require "the evidence of a degenerated ganglionic structure close to the exit of the nerve from the brain" in order to explain the possible presence in man of an afferent distribution of the facial nerve. The facial nerve in man and higher vertebrates possesses sensory branches corresponding to those of lower vertebrates, and there is no evidence to show that these have been replaced by branches of the fifth nerve, as Gaskell has suggested.

Dr. Gaskell states that "undoubtedly such nerves as the *chorda tympani* and the *petros. superficialis major*, which are known to be largely efferent, spring from this ganglion," *i.e.*, the geniculate ganglion. This statement is, of course, partly correct; but as regards the functions of these nerves, we shall see later that the efferent fibres (vaso-dilator and secretory) which physiologists have discovered in the *chorda tympani* are known to be connected with nerve cells in the neighbourhood of the submaxillary and sublingual glands, but are not known to be connected with other nerve cells, such as those of the geniculate ganglion, outside the brain. Indeed, the anatomical origin of these efferent fibres has been by no means satisfactorily determined.²²

Of especial interest in connection with the afferent distri-

bution of the facial nerve are the observations of Strong²³ in the tadpole and frog. He has shown that not only the internal mandibular, but also the palatine branch of the seventh nerve, in this animal, supplies taste fibres. His preparations, made by Golgi's method, show the terminal filaments of the palatine nerve ending in relation to those taste buds which, in this animal, are placed just behind the posterior nares, while the branches of the internal mandibular (chorda tympani) end in relation to the taste buds, in the anterior part of the floor of the mouth, in the region of the tongue. Microscopical investigation in the tadpole thus proves that the function of the afferent facial in this animal is similar to what we must consider it to be in man.

In mammals, the anterior portion of the tongue is supplied by two sensory nerves—the lingual branch of the fifth nerve and the chorda tympani branch of the seventh. (The former nerve is not present in lower animals,²⁴ and in this connection it is interesting to note its relatively late formation in man.²⁵) Intracranial section of the fifth nerve roots does not in man destroy taste sensation in the anterior part of the tongue, hence the chorda tympani must be the nerve by which the taste buds are innervated. Here I would specially like to refer to the cases reported by L. MacTiffany and by Krause, as well as to a case which, owing to the kindness of Mr. Lynn Thomas, I have had an opportunity of examining personally. L. MacTiffany²⁶ has published notes of the condition of three patients in whom he has removed the intracranial portions of the second and third divisions of the fifth nerve, and the part of the Gasserian ganglion attached to them, tucking at the same time the distal ends of the nerves into their foramina. In the first case, examined thirteen months after the operation, he says, "taste on the tongue is not interfered with." The method of conducting the investigation was as follows:—

"The tongue is drawn beyond the lips and securely held. Its surface was dried with a soft rag, and a drop of warm water, containing sugar or salt in solution, was put on the part of the tongue entirely without sensation, either, of general touch, heat, or cold. Almost instantly the patient was able to tell whether sugar or salt was put on her tongue, and this, of course, without drawing the tongue into the mouth, but while the tongue was firmly held outside the lips."

In the second case, a similar condition was found to exist four months after operation; while in the third case, although the patient stated that taste was the same as always, still the difference between salt and sugar is not recognised when applied on the tongue held beyond the lips.

The results of Krause²⁷ are not so uniform. In some of his cases taste was lost on the anterior parts of the tongue, while in others it was retained after complete removal of the Gasserian ganglion and the fifth nerve roots. I have attempted, in another place, to show that these varying results most probably depend on slight differences in the amount of damage done during the operation to neighbouring structures, and have called attention to the close proximity of the geniculate ganglion of the facial to the Gasserian ganglion in man.²⁸ In this connection, it is of interest to note that, owing to the more extensive raising of the dura mater from the floor of the middle cranial fossa in order to remove the entire Gasserian ganglion, as Krause had done, the underlying geniculate ganglion and its branches run a greater risk than when the branches alone of the Gasserian ganglion are removed.

In Mr. Lynn Thomas' case, two months after an operation, in which the right superior and inferior maxillary nerves were divided within the cranium, the patient tastes equally on both sides. He is able to distinguish sugar and salt on

the anterior part of the right side of the tongue, over an area which is otherwise perfectly anæsthetic. These substances can be recognised, when placed in solution upon the tongue, before the patient withdraws the tongue into mouth.²⁹

In Mr. Thomas' case, as in several others that have been recorded, the soft palate retains its sensibility after section of the fifth nerve trunks. We must, I believe, attribute the conveyance of sensory impulses in these cases to branches either of the ninth or of the seventh nerve, viz., to the small superficial petrosal branch of the ninth nerve, or to the great superficial petrosal branch of the seventh. The mode of development of the small superficial petrosal shows it to be undoubtedly an afferent nerve, and at present we have no direct anatomical evidence that it contains taste fibres as well as those of common sensation (see, however, p. 631). The intimate connection of the small superficial petrosal nerve in part of its course, to the dura mater of the middle cranial fossa, possibly explains why in certain cases of intracranial operation the soft palate loses its sensibility.

We may, perhaps, conclude from the distribution of the corresponding branch—palatine—in lower animals, that the great superficial petrosal nerve supplies in man the taste buds of the soft palate. At present we have no direct evidence that the seventh nerve contains fibres of common sensibility. Its chorda tympani branch certainly does not, as is clearly seen in those cases in which the central connection of the lingual nerve fibres with the brain is destroyed.

If we are right, not only in looking on the facial nerve as a partly sensory nerve, but in considering that its afferent fibres are concerned in conveying taste impulses, we are brought into direct conflict with the conclusions of many pathologists³⁰ and physiologists.³¹ I regret that, with the literature at my disposal, I have been unable to obtain

accounts of very many of those pathological cases which are supposed to prove the non-existence of taste fibres on seventh nerve.

None of the cases, however, which I have been able to obtain accounts of seem to me to be at all conclusive. For instance, in a case described by Dr. Gowers³² as lending weight to the idea that the fifth nerve conveys the taste impulses from the tongue, the lesion which has caused loss of taste is undoubtedly not confined to the fifth nerve roots. Not only is the sixth nerve paralysed, but the seventh nerve is also affected, as is shown by the wasting of the facial muscles. Dr. Gowers attributes this latter symptom to nutritive disturbances due to implication of the fifth nerve. That this is very unlikely to be the true explanation, is, however, shown by the fact that in cases where the Gasserian ganglion has been removed, wasting of the facial muscles has not ensued.

Dr. W. A. Turner³³ quotes a case described by Ferguson in the *Medical News*, Philadelphia, 1890, and says it appears to be a crucial case upon the course of the taste fibres for the anterior two-thirds of the tongue, if the facts are correctly stated." I have been unable to see the original description. Dr. Turner, however, says that "a small exostosis was observed *post mortem* to press upon and divide the left Vidian nerve. During life complete loss of taste had existed upon the anterior two-thirds of the left side of tongue, while the posterior third, the fauces, and the soft palate retained the sense of taste. Subsequent microscopic examination showed degeneration of the great superficial petrosal nerve, which was traceable into the ganglion geniculi facialis, and to pass through the facial trunk as far as the chorda tympani, through which it was traced to the lingual nerve." This case certainly seems to prove that the sen-

sations of taste from the anterior two-thirds of the tongue depend upon the sensory part of the facial nerve (*i.e.*, nervus intermedius and its branches), but one can scarcely believe, from what we know of its mode of development, that mere division of the Vidian nerve would cause degeneration of the chorda tympani. It seems more probable that degeneration of the cells of the geniculate ganglion may have been in this case primary, and have been followed by degeneration of the chorda tympani and superficial petrosal branches of the ganglion. The fact that in many cases complete removal of the Gasserian ganglion and fifth nerve roots has not led to degeneration of the chorda tympani (as is shown by the retention of taste sensation on the anterior two-thirds of the tongue), favours the idea that in Ferguson's case, as reported by W. A. Turner, the degeneration traceable through the geniculate ganglion into the chorda tympani, was not dependent simply on the section of the connection between the seventh and fifth nerves.

The existence of the sense of taste on the soft palate in this case may indicate that the ninth nerve supplies some of the taste buds on the soft palate, if we assume that all the fibres of the great superficial petrosal were involved in the lesion: this has not, however, been demonstrated anatomically.

With regard to pathological observation, although the balance of evidence may here tend towards the idea that the taste fibres belong to the fifth nerve as Dr. Turner states, still absolute proof is wanting. There are many cases recorded in which taste has been lost on the anterior part of the tongue, where the symptoms which presented themselves receive as satisfactory an explanation by assuming a lesion of the seventh nerve roots rather than one of the fifth nerve.³⁴ In any event, the small balance of evidence in favour of the fifth nerve, derived from pathological obser-

vation, does not seem important when weighed against the evidence in favour of the seventh, derived, for instance, from a study of cases in which the fifth nerve roots have been divided intracranially.

Physiological experiments have demonstrated the presence of other fibres besides taste fibres in the "chorda tympani" of mammals. Much attention has been paid to these fibres, which, leaving the tract of the lingual nerve, are destined for the sub-maxillary and sub-lingual glands.

By Professor Stewart³⁵ the term "chorda tympani proper" is restricted to the nerve formed by these "vaso-dilator" and "secretory" fibres as they leave the chordo-lingual nerve to reach the sub-maxillary and sub-lingual glands. Speaking of the connections of the vaso-dilator fibres with the central nervous system, he says that the overflow of vaso-dilator fibres takes place through the anterior nerve roots; some emerging with the roots of the cranial nerves. "It is believed that every vaso-motor fibre is interrupted by one, and only by one, ganglion cell between the cord and the blood-vessels." If this latter statement proves to be true, the vaso-dilator fibres of the "chorda tympani" of physiologists cannot represent the early developed chorda tympani of man, or the corresponding pre-spiracular nerve of lower vertebrates, since their ganglionic connections lie in the cells in the neighbourhood of the sub-maxillary and sub-lingual glands, and not in the geniculate ganglion of the facial nerve. The secretory fibres of the chorda tympani also become connected with nerve cells in the region of the glands which they supply, and they are not known to be connected with any other nerve cells outside the central nervous system. Many other physiologists,³⁶ just as Professor Stewart, consider that the only fibres of the chorda tympani that undoubtedly belong to the seventh nerve are the vaso-dilator and secretory ones mentioned.

With regard to the "chorda tympani" of authors with such views, we must note that the "chorda tympani" nerve which they describe is not the nerve which in lower animals springs from the ganglion of the facial, and which supplies the taste buds on the anterior part of the floor of the mouth. The "chorda tympani" of these physiologists is not a nerve of taste, since according to them the fifth or ninth nerve supplies the taste buds on the anterior part of the tongue. The fibres which constitute this "chorda tympani" end finally in the nerve cells (multi-polar) in the region of the hilum of the sub-maxillary gland or in the ganglion cells in connection with the nerves of the sub-lingual gland. At present nothing seems to be known of the mode of development of these "secretory" and "vaso-dilator" fibres in the chorda tympani; their representatives in lower vertebrates are not known; there is no evidence to show that their origin is similar to that of the taste fibres, which pass in the chorda tympani branch of the facial to the lingual nerve in man, and form the homologue, as we have seen, of the internal mandibular or pre-spiracular nerve of fishes.

It is a remarkable fact that physiologists recognise these "secretory" and "vaso-dilator" fibres in the seventh nerve with the greatest certainty, while they in many cases deny to the same nerve afferent fibres—most or all of which appear to be connected with taste—of which, as we have seen, we possess anatomical evidence. We have little or no anatomical evidence to show why we should refer the fibres which pass to the sub-maxillary and sub-lingual glands, and whose functions have been determined by physiologists to the facial nerve, rather than to the sympathetic system. It is noteworthy, for instance, that while the vaso-dilator fibres which leave the lingual nerve in the "chorda tympani" (for these glands) are referred to the seventh nerve, yet those which remain in the lingual tract, and are

distributed to the vessels of the tongue, are referred by physiologists to the cervical sympathetic.³⁷ Our knowledge concerning the morphology of the sympathetic system is at present in so unsatisfactory a state that it seems useless to speculate regarding it until more facts have been collected concerning the manner in which it is developed. Assuming that it is correct to relegate the various sympathetic ganglia of the head to particular cranial nerves as "vagrant ganglia," we have even then no certain evidence to show whether the sub-maxillary ganglion (or its cells) should be considered in connection with the fifth or with the seventh nerve.

One cannot help remarking in this connection that many statements, based largely upon theoretical considerations, have not rendered more clear the facts known regarding the morphology of the cranial nerves and their connections with the sympathetic. If we are right in drawing a sharp distinction between sympathetic ganglia and the ganglia of the posterior nerve roots—as from their mode of origin in the embryo and from their histological character in the adult seems justifiable—it is certainly inexpedient to call the ganglion of the seventh nerve in any sense a "sympathetic ganglion" simply because the fibres which spring from it "innervate visceral surfaces."³⁸ If the term "splanchnic" or "visceral" afferent is advantageously applied to a certain part of the distribution of the cranial nerves, as has been suggested by Gaskell, it seems unwise to go further and apply the term "sympathetic" to the ganglia from which these nerves spring. For instance, if the afferent distribution of the facial is to be considered "sympathetic" because it has to do with parts derived from the splanchnopleure, we must also apply the same term to the lingual branch of the fifth nerve, since it supplies the same part of the tongue as the chorda tympani, and thus the Gasserian gan-

gion will also be partly a "sympathetic" ganglion. At present, however, we have no evidence to show that the Gasserian ganglion is made up of two portions which are morphologically distinct; and Dr. Gaskell himself, in his diagram of the arrangement of the segmental cranial nerves, indicates the entire sensory part of the fifth nerve, with the exception of a small portion of the ophthalmic division, as somatic afferent.

Unless we are to completely alter the use of the term "sympathetic ganglion" it is most confusing to apply the name to ganglia which are essentially composed of cells of spinal ganglion type. The researches of Disse,³⁹ v. Lenhossek,⁴⁰ Dogiel,⁴¹ and others, have indeed shown that careful search may often reveal the presence of a very small number of cells resembling multi-polar cells, of typical sympathetic ganglia, in the spinal ganglia; still, these observations do not seem to justify us in homologising ganglia in whose general histological structure and embryonic history the greatest differences are to be noted.

Those attempts which have been made to reduce the various cranial nerves and their "stationary" and "vagrant" ganglia to a uniform type seem to be rash when we find that such attempts depend upon the substitution of multi-polar nerve cells for those known to be of spinal ganglion type to suit the pleasure of the author.⁴²

With our present knowledge of their mode of development it is most confusing to speak of the central origin within the brain of afferent nerve fibres, or to say of the pars intermedia that it takes origin from the fasciculus communis (funiculus solitarius),⁴³ or from the ninth nerve nucleus,⁴⁴ since one might just as well describe the afferent fibres of the various spinal nerves as taking origin from the posterior columns of the spinal cord, or as springing from the cuneate and gracile nuclei of the medulla.

CONCLUSIONS.

The facial nerve in man is in a condition comparable with that which obtains in lower animals. The nerve closely resembles in its distribution what has been called a "typical branchial nerve," or, as Cole forcibly states, "the mammalian facial bears in its present-day structure undoubted evidence of its descent from the branchial facial nerve of a fish." The facial consists of a motor and of an afferent portion, and is the nerve developed in connection with the spiracle (or ear cleft). The motor portion of the nerve lies behind the first cleft in the hyoid arch, and supplies the muscles developed in connection with this arch, while the afferent branches which spring from the cells of the ganglion of the facial are distributed to structures developed in connection with the wall of the anterior portion of the pharynx. These afferent branches in mammals are the chorda tympani and the great superficial petrosal nerves. Both these nerves are probably entirely or almost entirely composed of taste fibres. The chorda tympani nerve certainly does not convey common sensory impulses, but in the case of the great superficial petrosal this has not been proved.

The vaso-dilator and secretory fibres, which have been shown by physiologists to exist in the mammalian chorda tympani, do not form the whole of that nerve, nor do these fibres represent the primitive chorda tympani or pre-spiracular nerve of lower vertebrates. The chorda tympani is the primitive nerve supply of the anterior part of the floor of the mouth. With the development of the mammalian tongue the lingual branch of the fifth nerve is formed; but even in mammals, this latter nerve arises at a considerably later time, embryologically, than the chorda tympani.

These facts regarding the seventh nerve seem to be anatomically of primary importance, since they are supported by embryological observations in man, by the results of

comparative anatomists, as well as by direct experimental evidence.

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- ² Gray's *Anatomy*, 1897. Cleland and Mackay, *Human Anatomy*, 1896, pp. 550-552; see also, however, p. 548. Parker and Haswell, *Text-Book of Zoology*, 1897, vol. ii. p. 99, and others.
- ³ Schwalbe, *Lehrbuch der Neurologie*, 1881, p. 853 and p. 356. Macalister, *Text-book of Human Anatomy*, 1889, p. 607 and p. 664, and others.
- ⁴ Wilhelm His, "Die Anatomische Nomenclatur," 1895, p. 89.
- ⁵ "Die ersten Nervenbahnen beim menschlichen Embryo," and "Die morphologische Betrachtung der Kopfnerven," *Archiv für Anat. u. Physiol., Anat. Abth.*, 1887.
- ⁶ *Système Nerveux*, 2^e edition, 1897, p. 531 and p. 518.
- ⁷ *Lehrbuch der Anatomie des Menschen*, 1896, vol. ii., p. 467 and p. 469.
- ⁸ Quain's *Anatomy*, "The Nerves," 1895, p. 251.
- ⁹ See, for instance, Gray's *Anatomy*, 1897; Macalister, *Text-book of Human Anatomy*, 1889, pp. 601, 605, and p. 664. Cleland and Mackay, *Human Anatomy*, 1896, pp. 550-552 and p. 548. A *Treatise of Human Anatomy*, edited by Morris, 2nd edition, 1898. In this work the sensory nature of the pars intermedia and chorda tympani is clearly recognised, but "this nerve is regarded as an aberrant fasciculus of the glosso-pharyngeal nerve," p. 761.
- ¹⁰ "On the Development of the Branches of the Fifth Cranial Nerve in Man," *Abstract, Proc. Roy. Soc.*, 1895, and *Trans. Roy. Dub. Soc.*, 1896.
- ¹¹ "The Course of the Taste Fibres," *Edinburgh Medical Journal*, April and June, 1897.
- ¹² *Lehrbuch der Anatomie des Menschen*, 1896, vol. ii., p. 463.
- ¹³ See, for instance, Wiedersheim, *Elements of the Comparative Anatomy of Vertebrates*, adapted from the German by W. N. Parker, 1897, and Wiedersheim, *Grundriss der Vergleichenden Anatomie der Wirbelthiere*, 1898.
- ¹⁴ Huxley, *Anatomy of Vertebrate Animals*, 1871, p. 68.
- ¹⁵ Balfour, *A Treatise on Comparative Embryology*, 1881, pp. 376 and 377.
- ¹⁶ See, for instance, Strong, "The Cranial Nerves of Amphibia," *Journal of Morphology*, x., 1895. Pinkus, "Die Hirnnerven des *Protopterus annectens*," *Abdruck aus den Morphologischen Arbeiten* herausgegeben von Dr. Gustav Schwalbe, Bd. iv. heft. ii. Cole, "The Cranial Nerves of *Chimœra monstrosa*," *Trans. Roy. Soc. Edinburgh*, 1896. Strong, in his elaborate monograph, not only establishes these homologies in the different animal groups, but by tracing the component parts of the cranial nerves into the brain, he has succeeded in demonstrating many striking and important resemblances in the central connections of the cranial nerves in different groups of animals. Much confusion has arisen from the fact that the component parts of the seventh nerve become separated in different positions in the various animal groups, and different names have often been applied to the same collections of nerve fibres. Cole, in the paper above mentioned, compares the existing descriptions of the seventh nerve and of its branches in different animals, and points out homologies. He draws attention to the

marked correspondence between the branches of the facial nerve in fishes and in man.

¹⁷ See graphic summary of recent observations on the cranial nerves by Eduard Könige, "Zur Geschichte der Anatomie der Hirnnerven," Inaugural-Dissertation zur Erlangung der Medicinischen Doctorwürde, Freiburg, 1897.

¹⁸ "Das Ganglion geniculi Nervi facialis und seine Verbindungen," Beiträge zur Histologie des Nervensystems, 1894, p. 165.

¹⁹ Vergleichende Anatomie der Wirbelthiere, 1898, Bd. i. p. 812.

²⁰ "On the Relation between the Structure, Function, Distribution, and Origin of the Cranial Nerves," Journal of Physiology, vol. x., 1889.

²¹ His, "Die ersten Nervenbahnen beim menschlichen Embryo," Archiv. für Anatomie und Entwicklungsgeschichte, Anat. Abth., 1887, p. 375.

²² See page 633, this paper.

²³ "Cranial Nerves of Amphibia," Journal of Morphology, 1895, p. 121, pl. viii. figs. 8 and 10.

²⁴ Gegenbaur, Vergleichende Anatomie der Wirbelthiere, 1898, Bd. i. p. 808.

²⁵ Dixon, "The Development of the Branches of the Fifth Cranial Nerve in Man," Trans. Roy. Dub. Soc. 1896, vol. vi. p. 54.

²⁶ "Intracranial Neurectomy and Removal of the Gasserian Ganglion," Annals of Surgery, 1894, p. 51.

²⁷ "Die Neuralgie des Trigeminus," 1896.

²⁸ Edinburgh Medical Journal, June, 1897.

²⁹ Since this paper was written, through the kindness of Dr. Lynn Thomas I have been enabled to observe the condition present in a second of his cases in which he has divided intracranially the superior and inferior maxillary divisions of the fifth nerve. In this case the patient, before operation, possessed very acute taste sensibility, which after section of the nerves mentioned is quite unimpaired both on the tongue and on the soft palate.

³⁰ See, for instance, Gowers' Diseases of the Nervous System, 1893, vol. ii., p. 224.

³¹ Foster, Text-Book of Physiology, 1891, part iv., page 1404; Starling, Elements of Human Physiology, 1895; Stewart, Manual of Physiology, 1899; among many others.

³² "A Case of Paralysis of the Fifth Nerve," Edinburgh Medical Journal, Jan., 1897, p. 37.

³³ "Note on the Course of the Fibres of Taste," Edinburgh Medical Journal, Sept., 1897, p. 261. See also "Facial Paralysis and the Sense of Taste," Edinburgh Hospital Reports, vol. iv., 1896, p. 334, where Dr. Turner concludes that the taste impulses reach the brain either by the superior maxillary or inferior maxillary branch of the fifth nerve.

³⁴ An interesting case recorded by Dr. Gibson and Mr. Cattanach, "On the Coincidence of Facial Paralysis with Acute Anterior Poliomyelitis," Edinburgh Hospital Reports, 1896, illustrates the extreme difficulty often experienced in determining the causation of such clinical symptoms as loss of taste.

³⁵ A Manual of Physiology, 1899.

³⁶ Professor Starling considers the chorda tympani, in as far as it is composed of secretory and vaso-dilator fibres, to be a branch of the facial nerve, while, on the other hand, "the fibres of taste which are said to run in this

nerve are probably derived from the glosso-pharyngeal" (*Elements of Human Physiology*, 1895, p. 401, and p. 210, fig. 76). Professor Foster also comes to the "provisional conclusion" that although gustatory fibres may be found in the chorda tympani they really belong to the fifth nerve. Secretory and vaso-dilator fibres are, however, present in the chorda tympani branch of the facial (*Text-Book of Physiology*, part iv., p. 1404. See also fig. p. 397, part ii.)

³⁷ Starling, *loc. cit.*, p. 400.

³⁸ Cole, "Reflections on the Cranial Nerves and Sense Organs of Fishes," *Trans. Liverpool Biol. Soc.*, vol. xii., 1898, and "Observations on the Structure and Morphology of the Cranial Nerves and Lateral Sense Organs of Fishes, with special reference to the genus *Gadus*," *Trans. Linnean Society*, vol. vii. part v., Oct., 1898. In this latter paper we read that the facial ganglion of the cod is "physiologically and morphologically comparable to a sympathetic ganglion, since the fasciculus communis fibres belong essentially to the sympathetic system." Why the term "sympathetic system" should be used in reference to this tract formed within the brain, by entering afferent nerve fibres, it is difficult to understand.

³⁹ Über die Spinalganglien des Amphibien," *Verhandl. d. Anat. Ges.*, 1893, p. 201.

⁴⁰ "Zur Kenntniss der Spinalganglien," *Beiträge zur Histologie des Nervensystems*, 1894, p. 129.

⁴¹ "Der Bau der Spinalganglien bei den Säugetieren," *Anatomischer Anzeiger*, Bd. xii., June, 1896, p. 140.

⁴² See, for instance, "Plan of the arrangement of the constituent fibres of the cranial nerves of the bulb," Quain's *Anatomy*, vol. iii., part ii., p. 386, fig. 241.

⁴³ Cole, *Trans. Linnean Society*, vol. viii., Oct., 1898. Cleland and Mackay, *Human Anatomy*, 1896, p. 550.

⁴⁴ See, for instance, Morris' *Anatomy*, 1898, p. 761.; *loc. cit.*, p. 145.

DR. D. J. COFFEY thought the question of the nerve of taste one of the most difficult in connection with the physiology of the nervous system. Gowers recorded a case in which the nucleus of the fifth nerve appeared to be degenerated, and there was complete loss of taste. He (Gowers) suggested that the connection between Meckel's ganglion and the geniculate ganglion was a branch of Meckel's, and, therefore, derived from the fifth. In that way he worked the fibres of the fifth into the fibres of the chorda tympani, and in a similar manner he suggested that fibres of the fifth might enter the back of the tongue through the glosso-pharyngeal, and that the fifth nerve might thus send the fibres for taste to all parts of the tongue. He himself (President) did not think the chorda tympani absolutely established as the nerve of taste. He thought that the point of greatest value in Professor Dixon's paper was the

definite statement that fibres could be traced from the cells of the geniculate ganglion in both directions. This had, to his mind, established for certain that it is a sensory ganglion, and that both the prolongations must be sensory. He should like to hear how the sensory fibres are continued up to the nucleus of origin in the brain.

PROFESSOR SYMINGTON said that with regard to the distribution of the chorda tympani and the great superficial petrosal, on theoretical grounds he should be in perfect harmony with Professor Dixon. He attached more importance to the mode of development of these nerves than to any number of clinical observations or experimental work on nerves. There was no doubt if one can, from embryological evidence in the human subject, show that from the geniculate ganglion run fibres passing down the chorda tympani to the tongue, and also fibres growing along the great superficial petrosal, these fibres will not be motor. The key to the whole problem is the development of these nerves and their comparative anatomy.

DR. A. R. PARSONS said if the course which the taste fibres take were known with certainty it would be a great aid in the localisation of disease. He was acquainted with Gowers' idea. If the demonstration just given were correct, the question at once arose—Was the pars intermedia of Wrisberg to be looked upon as a continuation backwards of these taste fibres, and is the pars intermedia the nerve of taste of which the chorda tympani and the great superficial petrosal are, to a certain extent, branches? Was it Prof. Birmingham's view that the pars intermedia of Wrisberg is the nerve by which the impulses pass backwards from the tongue and palate, and that it is a sensory nerve instead of a motor, and supplies sensation to the palate? If the great superficial petrosal nerve is not the motor nerve of the palate, what is it?

DR. D. J. COFFEY said that if the chorda tympani nerve is cut, loss of taste follows. The loss of taste must not be exclusively explained on the assumption that the chorda tympani nerve contains fibres from the organs of taste, for the chorda tympani nerve may contain other fibres, and there may be an atrophic change in the mucous membrane which would disturb sensation. He thought that Dr. Parsons was on the right line in suggesting the pars intermedia. It is highly probable that the pars intermedia arises as part of the nucleus of the glosso-pharyngeal, and then the glosso-pharyngeal would be established as the nerve of taste. This would

be quite in harmony with the other senses—*i.e.*, supplied by one nerve.

DR. BIRMINGHAM, in reply, said Professor Dixon did not hold it proven that the great petrosal is a nerve of taste, but he considered this view extremely probable, and for these reasons:—First, he has shown that it is an afferent nerve; and, secondly, it corresponds, very probably, to that palative nerve in the fish which has been traced to the taste buds of the palate. Regarding the course which the taste fibres pursue towards the brain from the geniculate ganglion, Professor Dixon does not state it definitely in his abstract, but one could infer that he believed that the fibres of the chorda tympani and the great petrosal pass backwards through the pars intermedia to the brain. He (Professor Birmingham) agreed with the President that the pars intermedia probably is connected in the medulla with the upper end of the nucleus of the glosso-pharyngeal. Dr. Parsons was specially interested in the nerve supply of the palate. W. A. Turner showed that of the muscles of the soft palate, the levator palati and azgos uvulæ are supplied through the pharyngeal plexus by the spinal accessory. Lastly, according to Professor Dixon's embryological researches, there ought to be no efferent vasco-dilator or secretory fibres in the chorda tympani nerve; if there are efferent fibres in it, they probably come from the sympathetic or some other cranial nerves.

A COMPARISON OF THE PELVIC VISCERA AND THE PELVIC FLOOR IN TWO ADULT MALE SUBJECTS.

By JOHNSON SYMINGTON, M.D. ;

Professor of Anatomy, Queen's College, Belfast.

[Read in the Section of Anatomy and Physiology, February 3, 1899.]

COMPARATIVELY few observations have been published on the extent of the variations in the position of the bladder, rectum, and pelvic peritoneum as seen in different individuals under somewhat similar conditions. This is also the case in connection with the degrees of thickness of the pelvic floor.

Theoretically, there must be a decided tendency to the occurrence of such variations. During the periods of development and growth marked changes take place in the position of the bladder and the rectum, and any arrest or excess of these movements will affect the position of these organs in the adult. Further, the pelvic floor is made up largely of muscles and fat, and no structures in the body vary more in their amount. Such theoretical deductions are confirmed by a comparison of the two specimens (see figs. A and B) now to be described.

Subject A (male), aged 27 years, rather thin; muscular system of average development, and general form of body normal.—As this subject was selected for class demonstrations on the topography of the abdominal viscera, it was hardened by the injection of a solution of formal before being brought into the dissecting-room. When the peritoneal cavity was opened, and the coils of the intestine lying in the true pelvis were removed, the rectum was found empty and contracted, while the bladder was relaxed, and contained only a very small quantity of urine. On

Fig A

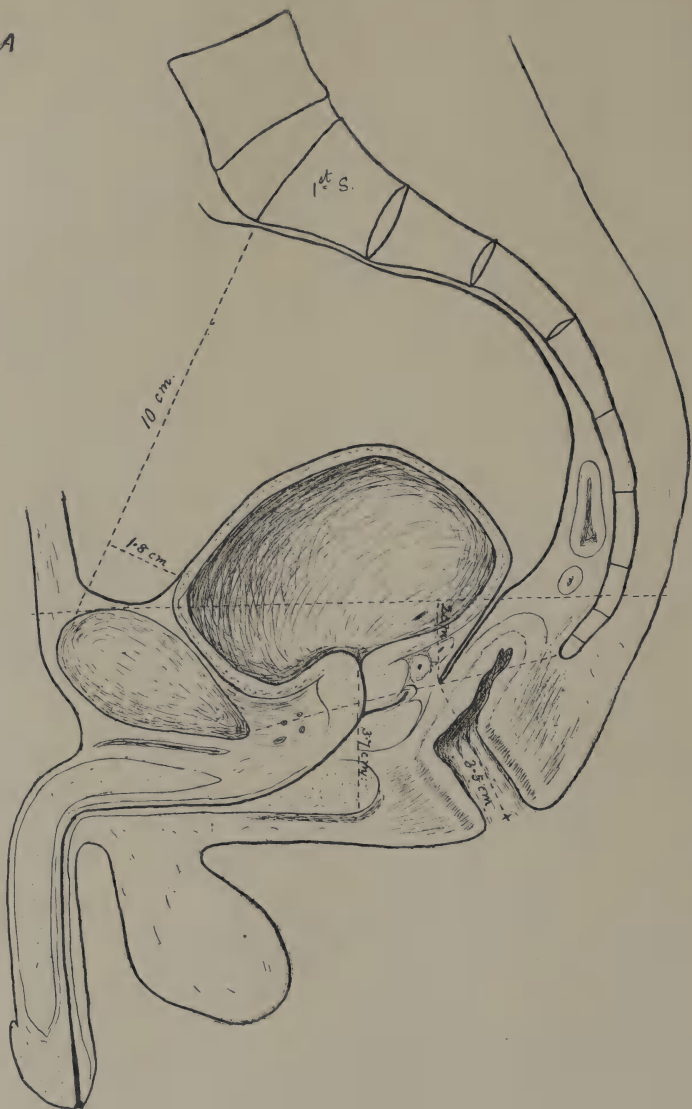
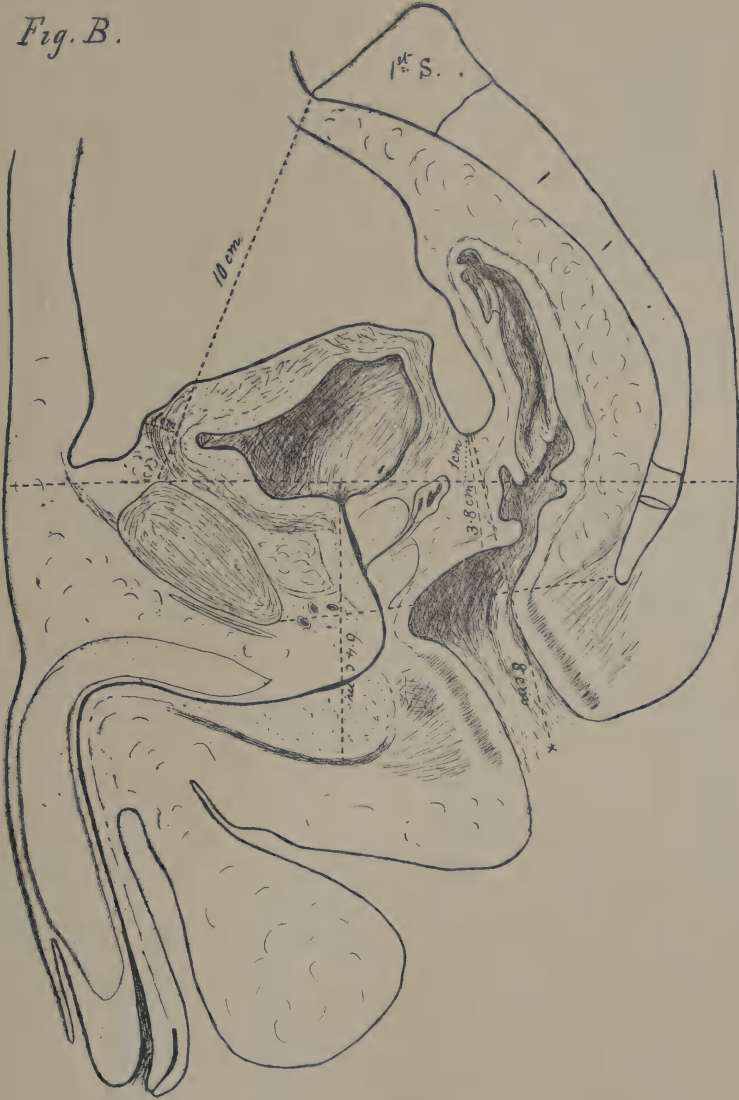


Fig. B.



digital examination of the recto-vesical pouch of peritoneum, the vasa deferentia, the vesiculæ seminales, and the prostate gland were easily felt through its anterior wall. By keeping one hand in the pelvis, and passing a finger of the other hand through the anus, it was readily ascertained that the recto-vesical pouch reached downwards nearly to the upper end of the anal canal, or perineal portion of the rectum. In order to make a more careful study of this specimen the entire pelvis was removed and placed in a 5 per cent. solution of formal. To ensure a thorough hardening of the bladder 200 c.cm. of formal solution was injected through a ureter into its cavity. After being kept several weeks in this fluid the pubic symphysis and the pelvic contents were divided with a knife in the median plane, and the section of the pelvis was completed by sawing through the sacrum.

Subject B, about 40 years old.—For comparison with the above I have selected the section of an adult male pelvis which has been in my collection for several years, and a drawing of which will be found in "Quain's Anatomy," 10th edition, vol. iii., part 4, p. 114. The body from which this specimen was prepared was hardened by the injection of Muller's fluid, and subsequently of spirit. The section was made, as in subject A, with a knife and saw, after the tissues were thoroughly fixed. The greater part of the rectum was empty and contracted, but just above the anal canal it contained some faeces. The bladder was moderately contracted, and held about 100 c.cm. of urine.

These subjects were both of average height, and the size of their bony pelvis almost identical. Thus the conjugate of the pelvic inlet was 10 cm. in each case. The outlet was 7.6 cm. in A and 8.2 cm. in B. This slight difference apparently depended upon a greater development of the sub-public ligament in A, and the coccyx being turned rather

more forwards. The sacrum in A, however, was more concave from above downwards, so that the antero-posterior extent of the pelvic cavity was greater than in B. The anterior surface of the sacrum and coccyx, measured in the median plane, and following their curvatures, was 7.6 cm. in A and 8.2 cm. in B. Muller's fluid, employed for the hardening of subject B, is very liable to distend the subcutaneous and submucous connective tissue when injected into the vessels, but this distension disappears, at least to a large extent, when the hardening is completed, as in this case, by spirit.

The principal differences between these two bodies were, that A was thin and almost destitute of subcutaneous fat, while B had a better muscular development, and his adipose tissue was abundant.

Bladder.—This organ was relaxed and nearly empty in A, and about 200 c.cm. of formal solution was injected into its cavity through one of the ureters; in B it was moderately contracted, and contained 100 c.cm. of urine.

In specimen A the bladder was situated entirely in the true pelvis, and no part of it reached a point nearer than 17 mm. from the plane of the pelvic inlet; while in B, although it did not contain so much fluid, a small portion of its wall projected 1 cm. above this plane.

The urethral orifice is a convenient point to select in estimating the position of the basal portion of the bladder. It must be remembered, however, that this orifice, although more firmly fixed than the other parts of the bladder, is still subject to considerable displacement. Thus Garson^a and others have shown that distension of the rectum pushes it upwards and forwards; and I^b have endeavoured to prove

^a“Die Dislocation der Harnblase und des Peritoneum bei Ausdehnung des Rectum,” Arch. f. Anat., 1878.

^b“The position of the empty and distended bladder in the male child.” Edinburgh Medical Journal, April, 1885.

that during distension of the bladder the urethral orifice is depressed and the prostatic portion of the urethra shortened.

The opening of the urethra in A was 6.5 cm. from the nearest point on the conjugate of the pelvic inlet, and in B 4.4 cm. According to Disse^a the average distance is 5.5 cm. In A the orifice was 12 mm. below a horizontal line passing backwards from the upper body of the pubic symphysis, while in B it was only 3 mm. Disse gives 5.5 cm. as the average distance between the upper border of the pubic symphysis and the urethral orifice; in A it was 7.0 cm., and in B 5.0 cm. From these measurements it is evident that the urethral orifice is higher up and farther forwards in B than in A, and that the difference is more marked in the antero-posterior than in the vertical direction.

The urethral orifice is generally regarded as the lowest part of the interior of the bladder, and such is usually the case. In A, however, the most dependent part is situated in front of the prostate and behind the pubic symphysis. Professor Wardrop Griffith recently showed me a section of an adult male pelvis in which the same condition existed. In both these cases the subjects were very thin, and I am inclined to attribute this depression to the absence of the retro-pubic pad of fat. Of course other conditions, such as enlargement of the prostate, may alter the relative levels of the urethral orifice and of this part of the bladder.

Curve of Urethra.—The most striking difference in the curvature and direction of the urethra between A and B is that in the latter the urethra passes from the vesical orifice straight downwards and backwards through the prostate gland, and in the membranous portion turns rather abruptly downwards and forwards, while in A this change in the direction of the urethra occurs about the middle of its prostatic portion. It is easily conceivable that a distension of

*“Untersuchungen über die Lage der menschlichen Harnblase und ihre Veränderung im Laufe des Wachstums,” Anatomische Hefte, Heft 1, 1891,

the lower part of the rectum in A, by pushing upwards and forwards the prostate and the bladder, would cause its urethra to assume a direction very similar to that of B.

Rectum.—Down to the level of the middle of the third piece of the sacrum the rectum in A had a thin and long meso-rectum, and was consequently freely movable. Below this it became fixed to the sacrum, devoid of peritoneum on its posterior aspect, and was placed almost entirely to the left of the mesial plane as far as the tip of the coccyx, but where it rested on the ano-coccygeal body it was median in position. The whole length of the rectum was empty and contracted. In B the median section exposed the cavity of the rectum from the level of the lower border of the 2nd sacral downwards to its termination, and above the part shown in fig. B it had a meso-rectum, the two peritoneal layers of which were separated by a quantity of fat. There was also a considerable amount of fat separating the rectum from the anterior aspect of the lower part of the sacrum and from the coccyx. The facility with which even a slight amount of faeces in the ampulla of the rectum can push forwards the anterior part of this space so as to bring it into close relation with the membranous portion of the urethra is well shown in this subject. Thus the thickness of the tissue between the cavity of the rectum and the lumen of the urethra is only 5 mm. In A, where this part of the rectum was empty and its lumen in the form of a transverse slit, the distance between the two cavities was 2.3 cm. These relations are of interest in connection with the well-known clinical fact that faeces in the lower part of the rectum may interfere with micturition, and they also show how the mobility of this part of the rectal wall allows a catheter in the membranous portion of the urethra to be felt so readily per rectum.

Peritoneum.—In A this membrane is in contact with the

upper and posterior surface of the symphysis for a distance of about 13 mm. before passing backwards to the bladder, while in B the peritoneum did not reach the pubic symphysis, being reflected from the anterior abdominal wall on to the bladder 10 mm. above its upper border. The difference, however, is still more marked in connection with the levels of the respective recto-vesical pouches. Thus in A the bottom of the recto-vesical pouch is 2 cm. below the level of the upper part of pubic symphysis; it corresponds to a line uniting the lower edge of the pubic symphysis with the tip of the coccyx, and is 3.5 cm. from the middle of the anal orifice. In B this pouch is 1 cm. above the level of the top of the pubic symphysis, 3.6 cm. above plane of pelvic outlet, and 8 cm. from the anus. The relations of the peritoneum in B are nearly identical with those of an adult male shown in plate 1 of Braune's "Topographisch. Anatomischer Atlas." As the bladder contained only about 100 c.cm of urine, and the rectum was nearly empty, the peritoneum was probably a little higher than usual for such states of the bladder and the rectum. The fat, however, which was situated behind the rectum probably compensates for the slight distension of this organ. Waldeyer^a gives the height of this pouch above the anus as 5 to 6 cm. In Braune's section it is 7.8 cm. and in my specimen B 8 cm., so that Waldeyer's estimate is too low for subjects in whom the muscular and adipose tissues are fairly well developed. Traeger^b gives 5.5 cm. and 10.8 cm. as the two normal maxima, and such a range of variation is not too great.

In A the peritoneum is undoubtedly abnormally low, even for a thin subject with an empty rectum. This remark

^a Das Becken, p. 279.

^b "Ueber abnormen Tiefstand des Bauchfelles im Douglas'schen Raume beim Manne," Arch. f. Anatomie, 1897.

applies especially to the recto-vesical pouch which reaches down to the plane of the pelvic outlet, and is only 3·5 cm. from the anal orifice. The peritoneum reached even lower than this when the bladder was empty, as it was raised somewhat by the injection of 200 c.cm. of formalin solution into the bladder. Such a lower position of the recto-vesical pouch is of embryological and of surgical interest. In an embryo 35 mm. long Zuckerkandl^a found that the cœlum extended caudad between the hind gut and the Wolffian ducts to a point distinctly beyond the union of the sexual and urinary ducts, and he states that until about the middle of foetal life the rectal aspect of the prostate is completely covered by peritoneum. In the newly-born child the peritoneum usually reaches as low as the upper border of the prostate, and sometimes covers it slightly. The persistence in the adult of such a deep recto-vesical pouch as is found in the young foetus does not appear to be common, but Traeger^b has recently described a case in which the recto-vesical pouch extended to within 2·5 cm. of the anus. In Traeger's paper will be found the literature of the cases of so-called hernia of the recto-vesical pouch, and a discussion as to whether they are congenital or acquired. The fact that cases of abnormally deep recto-vesical pouches do occasionally occur is obviously of importance to the surgeon in connection with various operations on the rectum and the base of the bladder.

The Pelvic Floor.—This term is a convenient one for the mass of tissue which closes the pelvic outlet, and upon which the pelvic viscera rests. Owing to its connection with these viscera it is not easy to define precisely its upper limits, but on the whole the recto-vesical layers of the pelvic fascia

^a "Beiträge zur Lehre von den Brüchen im Bereiche des Douglas'schen Raumes," Deutsche Zeitschrift für Chirurgie, 1891.

^b Op. cit.

may most conveniently be regarded as representing the level of its upper boundary. This floor forms a compact mass, which serves to support the superincumbent organs, and is traversed by certain slits or faults, the walls of which are normally in contact, but can be separated to permit of the passage of the genito-urinary products and of the excreta from the alimentary canal. In the male these clefts are the urethra and the anal canal, while in the female it is still further weakened by the addition of another fault—the vagina. In consequence of the important part played by the pelvic floor in parturition, and its liability to fail as a supporting structure, special attention has been directed to its structure and functions in the female, more particularly by Berry Hart, and other obstetricians and gynæcologists. In the male it is only in the region of the anal canal that prolapse is liable to occur, the anterior portion of the pelvic floor being very thick and compact, and its cleft—the urethra—too small to constitute a source of weakness. Nevertheless, the thickness of the male pelvic floor and the relations of its constituent parts are of great importance in various surgical operations in the perineum. Both surfaces of the pelvic floor are very uneven, and some difficulty is experienced in the selection of suitable points from which to measure its thickness. The bladder, although intimately attached to the floor, must be regarded as resting upon it, while the prostate gland is embedded in it. The part of the second portion of the rectum which is situated in front of the coccyx rests upon the ano-coccygeal portion of the pelvic floor, and upon the lateral walls of the upper end of the anal canal. Both the rectum and the bladder serve as reservoirs in which material can be collected and retained, while the urethra and the anal canal are normally closed, and only open temporarily to allow of the discharge of the contents of the bladder and rectum. For

this reason I prefer the term "anal canal" to that of "third or perineal portion of the rectum." In a median section of the male pelvis the thickness of the anterior portion of the pelvic floor may be conveniently estimated by the distance between the urethral orifice of the bladder and a point on the skin of the perineum vertically below this. In the comparison of sections A and B, I have selected the under surface of the bulb of the corpus spongiosum, so as to eliminate the amount of subcutaneous fat. In A the distance between these two points is only 3·7 cm., while in B it amounts to 6·4 cm. We have already seen that the internal urinary meatus is higher in B than A, and it may also be observed that the under surface of the bulb is further below the plane of the pelvic outlet in B than in A, so that the greater thickness of the pelvic floor in B as compared with A is due both to the floor extending higher up in the pelvic cavity, and also to its projecting further downwards below its outlet. The thickness of the posterior part of the pelvic floor in the median plane can be measured by the length of the anal canal or of the internal sphincter. In A this is 2·3 cm., and in B 3·3 cm. A comparison of the two sections also shows that the mass of tissue between the anus and the coccyx is distinctly thicker in B than in A, and that the coccyx is much nearer the cutaneous surface in A than in B.

DR. EDWARD H. TAYLOR said that with regard to the acromion process he was much more inclined to agree with Professor Symington's view of this condition than with Arbuthnot Lane's. Professor Bennett also held the same view. He thought that the very fact of the presence of cartilage on the bones is very strongly in favour of their being epiphyses. He was much interested in the sections of the pelvis. In the excision of the rectum for cancer, the removal is greatly facilitated by opening up early the recto-

vesical pouch. The distance of the inner orifice of the urethra from the surface undoubtedly varies in different subjects.

PROFESSOR W. H. THOMPSON asked how the first diagram of the pelvis shown compared with the condition of the child—whether it is to be regarded as a kind of arrest of development.

PROFESSOR SYMINGTON, in reply to Professor Thompson, said that it was his own opinion that it represented a persistence of a foetal condition. In his work on the child he described the peritoneum as extending down as far as the commencement of the prostate. There is no doubt that at a still earlier period of foetal life it extends beyond this.

THE FORM AND POSITION OF THE THORACIC AND ABDOMINAL VISCERA OF THE RUFFED LEMUR (*LEMUR VARIUS*).

By CHARLES J. PATTEN, B.A., M.D. ;
Chief Demonstrator in Anatomy, Trinity College, Dublin.

[Read in the Section of Anatomy and Physiology, June 2, 1899.]

INTRODUCTION.

IN a paper dealing with topographical anatomy such as this, it is not necessary to consider the affinities^a which the Lemur claims to other groups of vertebrate animals ; more especially as little or no help can be gained by such a project. Suffice it to say, that the animal in question, together with some other kindred species, form a rather outlying class which appears to link together the quadrupal mammalia with the primates.^b Correlated with their zoological rank one might almost expect that the viscera, or at any rate some of them should participate of the characters intermediate between quadrupeds and true apes. But this is not the case, as we shall see later on, for the thoracic and abdominal organs of the Lemurs more closely resemble those of the lower rather than the higher mammals.

Perhaps the most important object of this investigation has been to determine the relations which the viscera present

^a Much information on this subject may be obtained from—(a) Mivart on "Zoological Rank of the Lemuroidea"—Proc. Zool. Soc., 1873 ; (b) Vogt and Specht on "Natural History of Mammalia," Vol. I., p. 77.

^b Systematists seem to have differed widely in their opinions as to the exact rank in which to place the Lemurs. Owen and Nicolson included them with true apes. Vogt and Specht point out their affinities with low orders of mammals such as marsupials. Thompson, Claus, and Sedgewick, &c., placed them in a separate order immediately below the true apes ; whereas, lastly, Mivart stood midway in his opinion between Thompson and Owen, and regarded the Lemurs ■ ■ ■ sub-order of the primates.

to the vertebral column, with a view to comparing the results with the same in man and the higher mammalia. In this way further data may be obtained for the purpose of helping to explain the relative changes in the position of the human viscera following the erect posture.^a

Methods of Preparing Specimens for Dissection.—In order to ensure the proper contour and position of the viscera, the two Lemurs which I dissected were first hardened. This was done by injecting them through the femoral artery with a 5 per cent. solution of formalin,^b and leaving them for a week to harden.

Every precaution was taken to prevent the viscera from becoming misshapen during the hardening process. The animals were laid stretched out on the flat of their backs, and to avoid the internal organs from being pressed upon a thick bedding of cotton wool intervened between the backs of the specimens and the wooden board on which they lay.

I was fortunate enough to obtain both a male and a female example at the same time. These died in captivity last winter (November) in the Dublin Zoological Gardens. The viscera appeared healthy on examination, peritoneal adhesions, tubercular nodules, &c., being absent.

I was pleased to see that such a variable organ as the liver presented practically the same form in the male and the female specimens. The same may be said of the spleen; hence, it is more than likely that these organs were of the average normal form.

As the illustrations will show, most of the dissections were made from the dorsum and sides of the animals, in order to

^a In the orang and gibbon the viscera are placed at a higher level than in the adult man, resembling more closely the position of the viscera in the infant. (See Cunningham on "Lumbar curve in man and apes," Trans. Royal Irish Acad., 1886, p. 139.) N.B.—In the Lemur the viscera are placed at a lower level than in man.

^b I have found this sufficiently strong provided that the animal is not dissected for a week after it is injected.

display the vertebral column and its relations to the level of the various viscera. When the dissections were proceeded with, and the interstitial connective tissue removed, the viscera tended to lose support, and to move from their normal position. This was prevented by at once supporting the parts with wires or pins. Photographs were then taken, and from these, as well as from the dissections themselves, drawings were made. In this way an attempt has been made to render the illustrations as accurate as possible.

PART I.—THORACIC VISCERA.

The thorax in the Lemur is long and narrow, its dorso-ventral diameter being much in excess of its lateral diameter. The viscera are correspondingly modified, the thickness of the lungs being greatly reduced. The sternum is very narrow, and its anterior^a surface is concave, the manubrium and lower end protruding more than the central portion. The ribs (thirteen in number) are slender, and their costal cartilages extremely long in proportion. Eight of these touch the sternum. The eleventh, twelfth, and thirteenth are floating ribs.

The Pleuræ.—Although the serous sacs hardly come under the category of viscera, still a brief description of them is necessary owing to their intimate relationship to the viscera over which they are reflected.

In the Lemur the pleura is composed, as in other mammals, of a parietal, mediastinal, and visceral portion. The parietal portion of each pleural sac lines the deep surface of the ribs and costal cartilages (pleura costalis), and reaching the back of the sternum below the third costal cartilage, it is reflected on to the pericardium, forming the mediastinal pleura, as in man. Above the third costal cartilages the two pleural sacs are widely separated, and do not reach the manubrium sterni,

^a For simplicity sake I am assuming the animal to be in the upright position.

but are reflected back from the deep aspects of the upper three costal cartilages. Behind the sternum the two pleural sacs only meet each other. The left does not overlap the right, as in man.

From the pericardium the pleura is reflected on to the root of the lung, clothing this organ with its visceral layer. Its intimate relations to the lung are so similar to the condition found in man that a separate description is not necessary here. But the relation of the pleural reflection on to the diaphragm requires notice. Indeed, as Tanja^a has shown, the level at which the pleura turns outwards from behind the sternum to reach the deep surfaces of the costal cartilages, and thence to be reflected on to the diaphragm, varies in different animals. In the carnivora—for example, the cat—the pleural sacs keep together behind the sternum and ensiform cartilage till they reach the level of the inner ends of the ninth costal cartilages. Here they separate by turning outwards. Each pleura then runs downwards and backwards upon the deep surfaces of the ninth costal cartilages, and from these is reflected on to the upper surface of the diaphragm. The line of diaphragmatic reflection is continued behind the tenth costal cartilage, the eleventh costo-chondral articulation, and behind the twelfth and thirteenth ribs back to the spine. In this class of animals the line of diaphragmatic reflection begins relatively low down.

Behind the sternum and ensiform cartilage the right and left pleural sac are in close contact, lying to the left of the mesial plane, and not overlapping each other (Plate I., No. 2).

In most rodents (*mus domesticus*; *sciurus vulgaris*, &c.) the relationships of the pleural sacs to the deep aspect of the sternum resemble that of the carnivora. In the common squirrel the pleural sacs keep together till they reach the

^a Ueber die Grenzen der Pleurahohlen bei den Primaten und Einigen andern Säugethieren *Morph. Jahrb.* Bd. xvii., 1891.

back of the ensiform cartilage. Here they separate, as in the case of the pleura of the carnivora, by turning sharply outwards. They then run down and back upon the deep surface of the eighth, ninth, and tenth costal cartilages, being reflected from these on to the diaphragm. The line of diaphragmatic reflection then passes behind the junction of the eleventh costal cartilage with its rib, and behind the twelfth rib back to the spine (Plate I., No. 3).

Proceeding higher up in the animal scale, we note that the pleural sacs deviate from behind the sternum or costal cartilages at a comparatively higher level. Thus in the chiroptera^a (bats) the pleura leaves the sternum along the line of the seventh costal cartilage, and the diaphragmatic reflection crosses the junction of the seventh or eighth costal cartilage with its rib, and from thence passing back behind the ninth to the thirteenth ribs to reach the spine (Plate I., No. 1).

The line of diaphragmatic reflection in the chiroptera, and its relations to the deep surfaces of the costal cartilages and ribs, is not unlike the condition found in man. This is all the more interesting when we consider that the thorax in bats^b is much wider, shorter, and capacious proportionately than is usual in the mammalia.

In the *Lemurs* there is a slight difference in the shape of the pleural sacs. The right is shorter and wider as in man. Above the third costal cartilages they are widely separated, and are not prolonged sufficiently forwards to reach the back of the sternum.

Below the level of the third chondro-sternal articulation, the two sacs approximate, and pass down in relation to the deep surface of the sternum as far as the inner end of

^a *Vespertilio* and *Pteropus*.

^b For a short account of the pleura and thoracic viscera in chiroptera, see N. H. Alcock on "Vascular System."—*Proc. Zool. Soc.*, Feb. 1, 1898.

the fifth costal cartilage. Here they separate owing to the deviation of the left sac outwards.

The right pleura continues straight down to the back of the xiphi-sternum. Then it turns outwards and downwards, and the line of diaphragmatic reflection passes from the deep surfaces of the seventh, eighth, ninth, tenth and eleventh costal cartilages, and the junction of the twelfth costal cartilage with its rib. Behind this the line of reflection passes from the deep surface of the thirteenth rib, below and behind which it reaches the spine at the level of the upper border of the transverse process of the second lumbar vertebra (A, Plate II.).

The left pleura having slightly deviated outwards at the level of the fifth costal cartilage, leaves a small area of the pericardium uncovered, and in contact with the anterior chest-wall. The pleura then passes downwards close to the sternum behind the fifth intercostal space, the sixth rib, the sixth intercostal space. It then inclines down and outwards, and the line of diaphragmatic reflection, from the seventh costal cartilage to the spine, is similar to that of the right side except that the left sac reaches a slightly lower level behind—viz., to the *lower* border of the transverse process of the second lumbar vertebra (C, Plate II.).

Neither pleural sacs reached to the bottom of the recess between the diaphragm and chest-wall, and connecting the uncovered part of the surface of the diaphragm and costal cartilages to the surface of the costal pleura is a well-developed *phrenico-pleural* fascia.

In most of the primates—Macacus, Cynocephalus, Ateles, &c.—the left pleural sac tends to deviate from the right one over the region of the pericardium, an arrangement similar to what I have described in the case of the Lemurs.

In quadrupeds the pericardium is more completely covered in front by pleura.

In primates also we find the line of diaphragmatic reflection in front, commencing at a comparatively higher level. For instance, in *Macacus inuus* (Barbary ape) and in *Cynocephalus babuin* (common Baboon) this begins along the line of the deep surface of the seventh costal cartilage. It then passes backwards and downwards behind the junction of the eighth costal cartilage with its rib (compare man), and crossing behind the ninth to twelfth ribs (Barbary ape) or to thirteenth rib (Baboon) it reaches the Spine at the level of the transverse process of the first lumbar vertebra (Figs. 4 and 5, Plate I.). The arrangement in most other apes is similar in the main.

Lastly, in the orang the pleural sacs turn outwards from behind the sternum as high as the level of the fifth costal cartilage. The diaphragmatic reflection crosses the junction of the sixth costo-chondral articulation, and passing backwards and downwards behind the seventh to twelfth ribs, reaches the spine at a level with the lower border of the last (twelfth) rib (Fig. 6, Plate I.).

From the foregoing account it will be seen that the relation which the diaphragmatic line of pleural reflection bears to the deep surfaces of the costal cartilages and ribs differs considerably in various animals. In some the reflection is related to a greater number of costal cartilages than ribs, crossing as low down as the eleventh or twelfth costo-chondral articulation, and only being related to the deep surfaces of the last rib or two. This is particularly well seen in the Lemur, and is accounted for by the *long* costal cartilages, and not by any marked alteration in the line of pleural reflection. On the other hand, in the bats and anthropomorphous apes the reflection is related to not only one or two costal cartilages, but to the lower five or

six ribs. These relations are more clearly brought out in the annexed table:—

Table showing the Relations of the line of Diaphragmatic Reflection of the Sub-costal Pleura to the Deep Surfaces of (1) the Costal Cartilages; (2) the Costo-chondral Articulations; and (3) the Ribs, in different Mammals:—

Name of Animal	Costal Cartilages	Costo-chondral Articulations	Ribs
<i>Felis domestica</i>	9 and 10	11	12 and 13
<i>Sciurus vulgaris</i>	8, 9, and 10	11	12
<i>Pteropus medius</i>	7	8	9, 10, 11, 12, 13
<i>Lemur varius</i>	7, 8, 9, 10, 11	12	13
<i>Cynocephalus mornon</i>	9	9	10, 11, 12, 13
<i>Cynocephalus sphinx</i>	7	8	9, 10, 11, 12, 13
<i>Cynocephalus babuin</i>	7	8	9, 10, 11, 12, 13
<i>Macacus innuus</i>	7	8	9, 10, 11, 12
<i>Satyrus orang</i>	5	6	7, 8, 9, 10, 11, 12
<i>Gorilla engena</i>	6	7	8, 9, 10, 11, 12, 13
<i>Troglodytes niger</i>	6 and 7	8	9, 10, 11, 12, 13
<i>Homo sapiens</i>	7	8	9, 10, 11, 12

In the *Lemur*, as in the other animals already mentioned, the upper limit of the pleura only reached to the level of the lower border of the first rib; indeed, in some animals it did not reach so high. Hence, the “cervical dome” rising into the root of the neck, and so characteristic of man, can hardly be said to exist in the lower forms.

The only animal in which I found the pleura protruding above the clavicle at all was in a Barbary ape, and in this particular specimen, which I dissected, I believe the pleura rose abnormally high up.

The Lungs.—In shape these organs are conical, being no exception to the typical form of mammalian lung.

The summit of the cone looks upwards, and forms the apex, which is more pointed proportionately than that of the human lung, but, unlike the latter, it does not protrude through the thoracic inlet into the root of the neck. In the lemur the apex of the lung only reaches to the level of the lower border of the first costal arch. Correlated with this we find that the groove for the subclavian artery is absent.

Owing to the highly vaulted condition of the diaphragm the base of each lung is markedly concave. The single cupola of the diaphragm rises to the same level on either side, so that the two lungs are much the same length; indeed, if any, the right reaches a little lower down than the left, owing to the transverse diameter of the base of the former being greater than that of the latter. Here we see, then, the left lung is the shorter, whereas in man it is the longer; but the left lung resembles that of man by its being the narrower of the two. (See dimensions on p. 664).

The base of the right lung is related to the right and cystic lobes of the liver with the intervention of the diaphragm.

The base of the left lung is similarly related to the left lobe of the liver and to a very small part of the fundus of the stomach. The spleen lies below and behind the stomach, and is placed at so low a level that it is not related directly to the base of the left lung. (See A, Plate IV.).

The outer surface of each lung is smooth, being covered with visceral pleura. The convexity of this surface is only poorly marked from before backwards (ventro-dorsal) owing to the narrow transverse diameter of the thorax. On this surface distinct depressed markings for the ribs and costal cartilages are seen (B., Plate III., also A. and B., Plate IV.).

The inner surface of each lung is less extensive from before backwards than the outer surface. It is somewhat

hollowed for the reception of the pericardium and heart, behind which is the hilum, containing the structures constituting the pulmonary root. In addition to these there are a number of *depressed areas* brought about by contact with neighbouring structures.

Thus on the inner surface of the right lung, behind the hilum, is seen an elongated depression for the reception of the trachea (*tr.*, Fig. A, Plate III.). In front of the hilum there are three depressions—the upper two lodged a quantity of fat (*d. f.* Fig. A, Plate III.). The lowest and largest depression (*a.*) received the auricle of the heart; behind and below this is a groove for the inferior vena cava, limited on the left by the “lobulus impar” (*i. c.*, Fig. A., Plate III.).

On the inner surface of the left lung, behind the hilum, is seen an elongated groove for the reception of the oesophagus (*æs.* Fig. A, Plate III.). This is joined at its lower part by the aortic groove (*aor.* Fig. A, Plate III.), which arches over the hilum from before backwards. In the aortic groove lies the descending thoracic aorta. The two grooves having coalesced, descend on the posterior part of the inner surface of the left lung to reach its base (*x.* Fig. A, Plate III.). In front of the hilum is seen an upper groove containing fatty tissue (*d' f.*, Fig. A, Plate III.), and a lower groove against which the ventricular part of the heart rests* (*h. v.*, Fig. A, Plate III.).

The anterior borders of the lungs are thin and sharp, with a rather irregular or sinuous outline, owing to the presence of a few shallow notches (*a. b.*, Fig. A and B, Plate III.). These borders are separated from each other

* In some lungs (hardened *in situ* with formalin, in the Anatomical Department, T.C.D.) of man, which I have lately examined, I found distinct sculpturing on the inner surface for the oesophagus and aorta. The rib impressions on the outer surfaces were also well marked.

by an interval, and they do not extend far enough forwards to reach the back of the sternum.* In the case of the left lung the anterior border turns outwards on approaching the pericardium, forming a well-defined "incisura cardiaca." This extends from the fourth rib to the seventh costal cartilage. Thus a considerable portion of the front of the pericardium is uncovered by lung.

The posterior borders (*p. b.*, Fig. A, Plate III.) are longer than the anterior. They are thicker, more rounded, and somewhat folded on themselves.

The posterior border of the right lung limits the tracheal groove behind. The same border of the left lung limits the oesophageal and aortic groove posteriorly.

The Fissures and Lobes.—The left lung is divided into two lobes by an oblique fissure, which extends downwards and forwards from the level of the eighth dorsal spine to the anterior end of the base of the lung. This fissure follows the direction of the long axis of the eighth rib (*f. m. A*, Plate IV.). Compared with some other animals as well as with man, the relation which this fissure presents to the vertebral column is distinctly low down. This will be more clearly brought out by comparing the level at which this fissure is situated in some other animals. A table with reference to this arrangement will be found on page 665.

The two lobes thus mapped out are very unequal in size, the upper being the larger. The lower portion of the upper lobe is incompletely subdivided by a short fissure, which commences in the incisura cardiaca at the apex of the heart, and runs downwards and backwards for a distance of $1\frac{1}{2}$ cm. It then changes its direction, and proceeds upwards and backwards for a distance of 5 mm.

* I noticed the same arrangement of the borders of the lungs in many of the apes which I hardened *in situ* with formalin. Here the lungs do not occupy to any extent the "sinus costo-mediastinalis" of human anatomists.

parallel to the main fissure. Owing to this incomplete subdivision of the upper lobe a short isthmus of lung tissue is formed. This is about $2\frac{1}{2}$ cm. long, and it lies behind the seventh intercostal space. This isthmus belongs to the upper lobe.^a (See *i. s.*, A, Plate IV.).

The whole upper left lobe is conical in shape, with an oblique base. The apex and anterior border and a small part of the front of the base belong to it, together with the upper two-thirds of the posterior border. The smaller lower left lobe, situated behind and below the fissure, is wedge-shaped. It includes the greater part of the base and the lower one-third of the posterior border.

The right lung is divided into three lobes by two fissures. The lower of these takes the same oblique course as that of the left lung—viz., from the eighth dorsal spine downwards and forward behind the eighth rib to the base of the lung. The upper fissure leaves the lower one about its middle, and takes a sinuous course upwards and forwards, extending from the eighth space to the inner end of the fourth costal cartilage (*u. f.*, Fig. B., Plate IV.).

The upper and middle lobes of the right lung are irregular in outline owing to the zigzag shape of the fissure separating them. To the upper lobe belong the apex and two-thirds of the anterior border, and the upper two-thirds of the posterior border. The remaining lower one-third of the anterior border, together with the front of the base, belong to the middle lobe.

The lowest lobe is triangular in shape, and takes in the greater part of the base and the lower one-third of the posterior border. The "lobulus impar," or azygos lobe, springs from this part of the lung at the junction of the base with the internal surface. It is a tongue-shaped process, one

^a Prof. Owen describes a fissure extending out from opposite the apex of the heart in the tapir (*Comparative Anatomy of Vertebrates*, Vol. III.). I noticed the same in a young baboon which I dissected.

and a half cm. long, which passes inwards between the back of the ventricular part of the heart and diaphragm. The "lobulus impar" limits posteriorly (dorsally) the groove for the inferior vena cava (*i. e.*, A., Plate III.).

Dimensions of the Lungs.

		Right	Left
Transverse diameter at the base	=	3 cm.	2 cm. + 7 mm.
Extreme length	=	11 cm.	10½ cm.
Long axis of base	=	7¾ cm.	5 cm. + 3 mm.
Dorso-ventral diameter across the root	=	5½ cm.	4¼ cm.
Dorso-ventral diameter at broadest part	=	7 cm.	5½ cm.
Length in Mid-axillary line	=	9½ cm.	10 cm.

Ratio between the extreme lengths of the (a) Pleura, (b) Lung, and (c) Thorax.

Thorax = 18 c.m., or nearly 7 inches.

Pleura = 15 " " 6 "

Lung = 10 " " 4 "

Limits of the Lung as the organ lay in situ.

Apex = to lower border of first costal arch.

Anterior border = from apex to inner end of seventh costal cartilage.

Lower border = from inner end of seventh costal cartilage backwards to the twelfth dorsal spine.

Posterior border = from twelfth dorsal spine to apex.

According to the following table it is evident that as the animals rise in the zoological scale the main fissure is situated at a higher level posteriorly. Finally, in man it begins opposite the second dorsal spine. In this way the obliquity of the fissure is increased, and at the same time the lower lobe and basal portions of the lung become larger in size. Thus the

weight of the organ is thrown as far backwards (dorsally) as possible, a condition manifestly favourable for the erect posture which man has assumed.

Table showing the Position of the Main Fissure of the Lungs in some of the Higher Mammalia.

NAME OF ANIMAL	RIGHT LUNG		LEFT LUNG	
	Behind	In front	Behind	In front
Lemur varius . . .	8th D.S.*	8th C.C.†	8th D.S.	8th C.C.
Mycetes niger . . .	4th D.S.	7th C.C.	3rd D.S.	7th C.C.
Cynocephalus babuin (Young)	5th D.S.	7th C.C.	5th D.S.	8th C.C.
Macacus sinicus . . .	5th D.S.	8th C.C.	5th D.S.	8th C.C.
Troglodytes niger . . .	4th D.S.	7th C.C.	4th D.S.	7th C.C.
Homo sapiens . . .	2nd D.S.	7th C.C.	2nd D.S.	7th C.C.

* Dorsal spine = D.S.

+ Costal cartilage = C.C.

The Trachea.—The thoracic portion of this tube is very long, consisting of 32 rings.^a The tracheal cartilages pass all the way round, so that each ring is entire. The lumen is circular, and its calibre measures 10 mm. The bifurcation into the two bronchi takes place as low as the eighth dorsal vertebra.

General Relations.—In front it is crossed by the left innominate vein, the aortic arch, and the great vessels which spring from it. The remains of the thymus depressor muscles of the larynx and sternum are superficial to these. The anterior relations are similar to those of the human subject. The posterior relations differ from those of man—thus behind, the trachea is not related

^a In some other Lemuroidea, viz. :—Chiromys (aye-aye), the total number of rings only amount to 26. (See Owen, *Anatomy of Vertebrates*. Vol. III.)

to the oesophagus, but to the vertebral column. The oesophagus lies to the left side, except at the bifurcation, where the trachea crosses it in front. On the right side it impresses the inner surface of the right lung as already described. The arch and descending aorta are related to its left side.

The Bronchi.—The main branches, prior to dividing, are relatively short, the right measuring only 4 mm. and the left bronchus 10 mm. The general relations to neighbouring structures differ in no way from the condition found in man and many other animals, hence a separate description of these is hardly necessary.

The morphology of the branching of the bronchi, and their relations to the branches of the pulmonary artery, deserve notice. On the right side the main bronchus divides into two primary branches; the upper of these enters directly the upper lobe. The lower again divides into two secondary branches, which enter the middle and lower lobes of the right lung.

The right pulmonary artery divides into branches corresponding to those of the bronchus. The upper primary branch of the artery enters the lung at a higher level than the uppermost branch of the bronchus; hence the bronchi are all hyparterial on the right side. Four pulmonary veins emerge from the root of the right lung; two of these return the blood from the upper lobe, one from the middle lobe, and one from the lower lobe. The upper three unite into one vessel prior to entering the left auricle. The vein from the lower lobe enters the left auricle separately.

The left bronchus divides into two primary branches—one for the upper and one for the lower lobe. The left pulmonary artery divides similarly; its upper branch enters the lung at a higher level than the upper bronchus,

whereas the lower branch passes downwards and enters the lower lobe of the lung below the lower bronchus. There are only three pulmonary veins at the left root; two of these pass out from the upper lobe, and unite into one vessel before entering the left auricle. The other vein leaves the lower lobe and enters the left auricle separately (*p. v.*, Fig. C., Plate III.).

The Pericardium.—This is a tolerably capacious sac^a, composed of a fibrous and serous layer. It lies behind the fourth, fifth, and sixth costal cartilages of the left side, and behind the fourth and fifth costal cartilages on the right side. Most of the front of the pericardial sac is related to the front of the chest wall directly, as the lung only slightly overlaps it.

The fibrous pericardium encloses a space which takes the shape of the heart. Below it narrows considerably, where it is attached to the diaphragm, so that the space for the apex of the heart is considerably curtailed. The broadest part is immediately below where the sac is prolonged on to the great vessels springing from the base of the heart. These vessels only receive a very short tubular investment. The other vessels (pulmonary) and the post-caval, or inferior vena cava, pierce the fibrous pericardium which is prolonged on the walls of these vessels as tubercular investments which gradually blend with their coats.

The post-caval vein pierces the pericardium very close to the auricle, so that its intra-pericardial course is very short, yet the length of the intra-thoracic portion of the vessel extended for 15 mm.^b

The serous layer lines the fibrous layer, and is reflected on to the surface of the heart at the entrance of the various vessels.

^a The area measuring $4\frac{1}{2}$ cm. long and $2\frac{1}{2}$ broad.

^b A rather similar relation of the fibrous pericardium to the post-caval vein is found in Chiroptera (See Vascular System of Chiroptera, by N. H. Alcock, Proc. Zool. Soc., 1898, p. 64).

The Heart.—The general shape of this organ is that of a cone with a well-formed broadened base, and a blunt, somewhat rounded, apex. The latter part is directed forwards and to the left, while the basal portion is situated closer to the mesial plane. Thus the position in the thorax is oblique—a condition found in the higher apes and man.

General relation and position:—The fourth, fifth, and sixth costal cartilages and part of the sternum lie in front, the pericardium intervening. Behind it is related to the 7th, 8th, 9th, and 10th dorsal vertebræ. The azygos lobe of the right lung is related to the back of the ventricular part of the heart, separating it from the diaphragm. Laterally the heart is lodged in distinct furrows on the inner surfaces of the lungs, the pleura and pericardium intervening. These have already been described.

External configuration.—This has a great resemblance to the human foetal heart, and so a brief description will suffice. The margins are very pronounced in character—the right (margo acutus) being sharp and thin; the left (margo obtusus) thick and rounded. The apex is rounded and proportionately shorter than that of man, and the extremities of both the left and right ventricles belong to it.^a The intra-ventricular furrows are but faintly marked, while the auriculo-ventricular groove is very distinct. Of the ventricular part, three-fourths are formed by the right ventricle in front and one-fourth behind.

The Chambers.—The auricles differ markedly in size, the right being fully twice that of the left. Two-thirds of the right auricle, with its appendix, are seen on the front, whilst no part of the left auricle is seen from this aspect. The interior of the auricles present but little peculiarities. In the right auricle the remains of the Eustachian valve is seen in its usual position. The valve of Thebesius guarding

^a This observation was demonstrated by making cross-sections of the heart through the apical region.

the coronary sinus is almost obsolete.^a The muscoli pectinati are very pronounced, terminating in a well-marked "crista terminalis." The fossa ovalis, surrounded by its annulus, is also easily made out. The muscoli pectinati of the left appendix are finer and more closely set than those of the right. The left atrium is a very limited area placed quite posteriorly. The four pulmonary veins devoid of valves open into it. The walls of the ventricles differ greatly in thickness—that of the right being 2 mm., the left one 8 mm. The capacity of the chambers differ accordingly, that of the right being greater than the left. In transverse section the outline of the right ventricle is crescentic, owing to the inter-ventricular septum bulging into it; this partition is thick and fleshy, measuring in cross section 6 mm. The outline of the left ventricle is nearly circular.^b The columnæ carneæ and chordæ tendineæ are well marked; those in the right ventricle being fewer in number, but coarser and more strongly developed. In the left chamber the columnæ carneæ are numerous and small, giving a reticulated appearance to the inner wall. The auriculo-ventricular valves and papillary muscles are constructed similarly to those of *Bimana*. From the base of the anterior papillary muscle of the right ventricle a feebly-marked short moderator band extends to the septum.

Dimensions and Weight of the Heart :—

Length, base to apex	= 5 cm.
Breadth at base	= 3 cm.
Extreme thickness (back to front)	= $1\frac{3}{4}$ cm.

^a This valve I found present in the right auricle of the Baboon, Barbary ape, and other catarrhine monkeys.

^b The condition of the ventricular chambers of the heart at death differed in the two Lemurs which I dissected. In the ♀ the wall of the left ventricle was contracted, hard and firm (Systole). Its interior was empty and of very small capacity. The right ventricle was somewhat distended, relaxed, and full of clotted blood. In the ♂ the left ventricle was distended with clotted blood, whereas the right ventricle was empty.

There was a slight difference between the weight^a of the hearts in the male and female as follows:—

Male - - - 150 grains.

Female - - - 143 „

The Great Vessels.—These only require a brief and general description. The ascending part of the aorta is very short (2 mm.). Its origin is hidden from view by the right auricular appendix (*a. p.*, D, Plate III.). The aortic valve of three segments in no wise differs from the human form. Only two vessels spring from the aortic arch, carrying the blood-supply to the head and neck and upper limbs. Each of these vessels has a relatively long course ($3\frac{1}{2}$ cm.) before giving off branches. The vessel to the right (innominate) divides into three branches—the right subclavian, right common carotid, and left common carotid. The other vessel is the left subclavian (*l. s.*, *l. c.*, *r. c.*, *r. s.*, C and D, Plate III.).

The descending aorta passed downwards and backwards, and crossed the oesophagus. Its relations to the inner surface of the left lung has already been described. The pulmonary artery pursues a short course upwards and backwards, under the aortic arch. Its length from origin to bifurcation into right and left vessels is only 5 mm. The construction of the valve resembles that of man. The conus arteriosus at the root of the pulmonary artery is well marked (*c. a.*, D, Plate III.). The relations of the right and left pulmonary arteries at the root of the lungs have already been described.

The precava or superior cava is a relatively long vessel ($3\frac{1}{2}$ cm.) which lies in front of and somewhat to the right of the trachea, but separated from that structure by a distinct fatty pad.^b The latter occupied a depression on the

^a Taken from spirit specimens.

^b Microscopic examination showed that this fat contained the remains of thymic tissue.

inner surface of the right lung (*f.*, A, Plate III.). The post-cava, or inferior vena cava, has a distinct intrathoracic course of 15 mm. in length. Its relation to the fibrous pericardium and inner surface of the right lung have been described.

Four pulmonary veins open into the left auricle, two from each lung. Their position at the root of the lungs has, in a great measure, been examined; they lie ventral to the corresponding arteries.

Summary Remarks on the Heart and Pericardium.—Speaking generally, the Lemurian heart with its pericardial sac resemble more closely the same organs in primates than in lower mammalian forms. In many of the latter the ventricular walls are smooth (ungulata rodentia), the Eustachian^a and Thebesian^b valves are absent, and the fossa and annulus ovalis^c but feebly marked or absent. These structures, we have seen, are well marked in the Lemur's heart, and the ventricular walls are rendered irregular by the presence of well-developed and numerous columnæ carnæ. These also characterise the heart-chambers of quadrumana and of man. The very small Thebesian valve and relatively longer post-caval vein are the chief distinctive characters between the Lemurian heart and that of the primates.

The attachments of the pericardium to the diaphragm in Lemurs differ only in a degree from the condition found in higher forms. In the latter it is more extensive; indeed, as pointed out by Prof. Owen, as the quadrumana ascend in the scale the pericardium becomes less perpendicular in the thorax, and spreading out at the apex of the heart it gains a more extensive attachment to the diaphragm. *Pari*

^a Cetacea, ungulata, carnivora.

^b Cetacea, ungulata, carnivora (freely developed).

^c Marsupialia. Cetacea (feeble). (See Owen's Comparative Anatomy of Vertebrates.)

passu with this change the intra-thoracic part of the post-caval vein becomes shortened in its course. Finally, in man, as it has been shown, this vessel has practically no course within the thorax at all, for it pierces the pericardium and enters the right auricle, as they rest directly on the diaphragm.

The Œsophagus.—This part of the alimentary canal enters the thorax to the left of the middle line. It curves gradually to the right and reaches the middle line at the level of the eighth dorsal vertebra^a—a spot corresponding to the bifurcation of the trachea. The latter structure is related to its right side in the upper part of its course. Having reached the mesial plane the gullet descends, lying behind the left bronchus, the pericardium and diaphragm. It pierces the latter opposite the twelfth dorsal vertebra.^a The opening is situated immediately above and in front of the aortic opening, both practically occupying the middle line. (See Diaphragm.)

In the abdomen the œsophagus has a course of half an inch before it ends at the cardiac orifice.^b

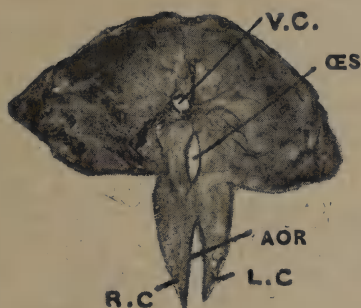
Related to its left side is the posterior part of the mesial surface of the left lung. This, as has already been pointed out, is impressed for the reception of the tube.

The aorta descends to the left of the gullet until it reaches the back of the diaphragm. Here, owing to the inward inclination of the artery, the gullet lies in front of it. Behind, the œsophagus rests on the vertebral column, certain smaller structures intervening, corresponding to those found in man. Below the root of the neck the calibre widens somewhat; it narrows again about $2\frac{1}{2}$ cm. above the diaphragmatic opening. Its entire intra-thoracic length is 15 cm.

^a Compared with man these positions are at a relatively lower level.

^b A rather similar condition is to be found in *chiromys*, in which the œsophagus has a distinct intra-abdominal course of one-third of an inch. (See Monograph on the Aye-aye.—Owen, Trans. Zool. Soc., 1866.)

The Diaphragm.—Compared with many other animals, and particularly man, the diaphragm of the Lemur is highly vaulted. The bases of the lungs are correspondingly hollowed out. The under surface is evenly concave; forming one cupola, which is occupied by a considerable part of the upper^a surface of the liver. The lower end of the extreme left side of the cupola lodges a small part of the fundus of the stomach (d. Fig. A, Plate IV.).



Photograph of the under surface of the diaphragm of the Lemur much reduced in size.

V. c. = Opening for the post-caval vein.

Æs. = Œsophageal opening.

Aor. = Aortic opening.

R. c. = Right crus.

L. c. = Left crus.

The posterior or dorsal part of the diaphragm is prolonged backwards in the form of a pair of long pointed crura. These are well developed, and reach as low down as the 4th lumbar vertebra. The right crus is larger and a little longer.

The Œsophageal opening is very elliptical in shape. It perforates the muscular part of the diaphragm, and its position relative to the aortic opening has been indicated. The latter is situate between the diverging crura. It is very elongated, and the aorta passes obliquely through it at the level of the first lumbar vertebra. The opening for the

^a Or anterior surface if the animal is on all-fours.

post-caval vein is ventral, and to the right of the other two foramina. It pierces the tendinous part of the partition opposite the tenth dorsal vertebra.

CONCLUSION.

I have been obliged, for want of time, to postpone the publication of the rest of this paper. The remainder shall be distinguished as Part II., dealing with the abdominal and pelvic organs.

I have much pleasure in expressing my thanks to Professor Cunningham for placing the material at my disposal, also for his kind help, with that of Professor Symington's, in expressing their opinions regarding doubtful and intricate questions; to Mr. W. D. Latimer for the great assistance he has rendered me, and the careful judgment he has displayed in photographing many of the dissections; and to Mr. C. K. Bushe for the excellent drawings executed by him for the purpose of illustrating this paper.

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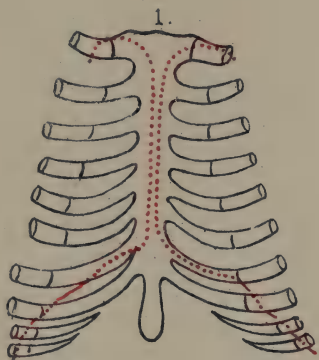
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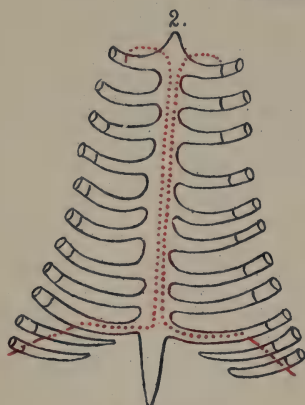
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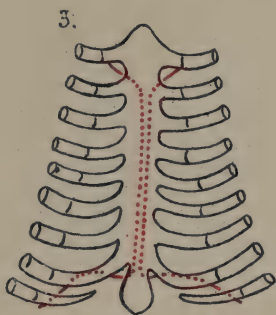
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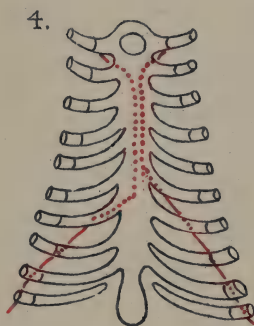
Pteropus. (after Tanja)



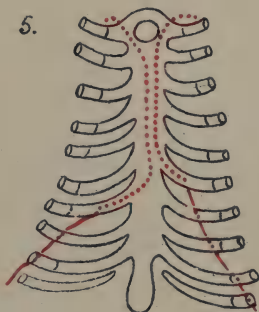
Felis.



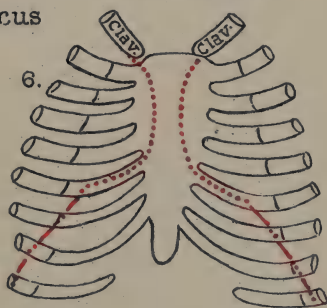
Sciurus (Tanja)



Macacus



Cynocephalus



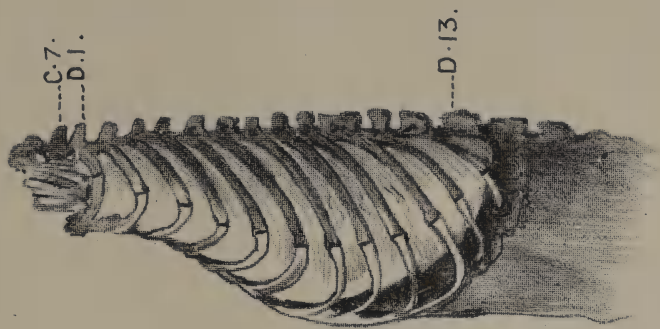
Simia



(A)

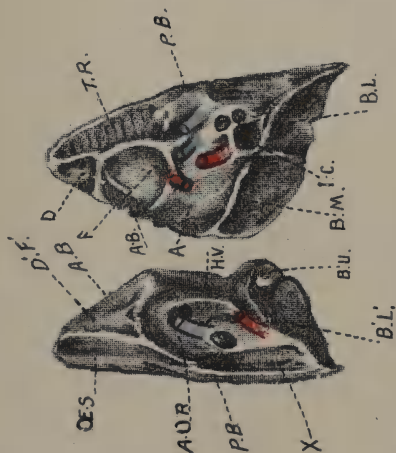


(B)



(C)

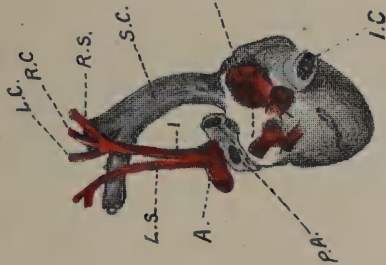
The Subcostal Pleura of the Lemur.



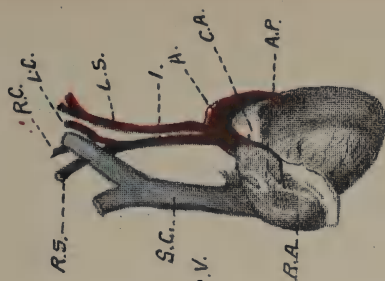
(A)



(B)

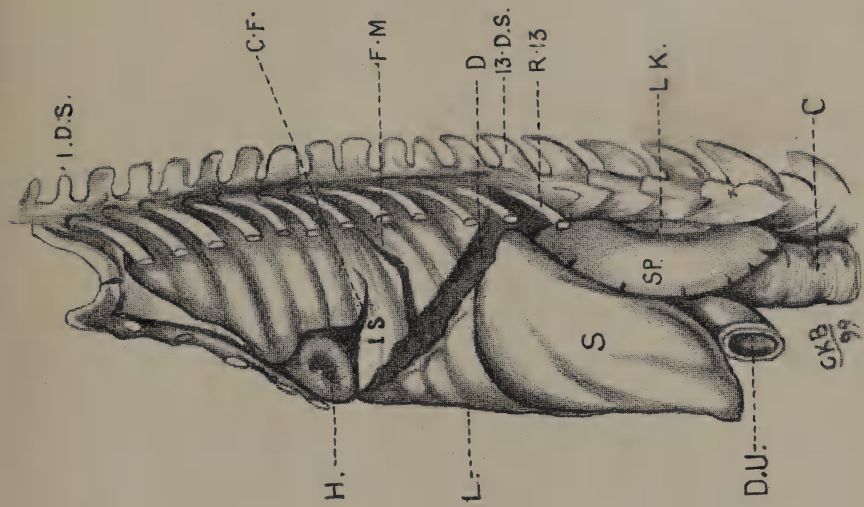


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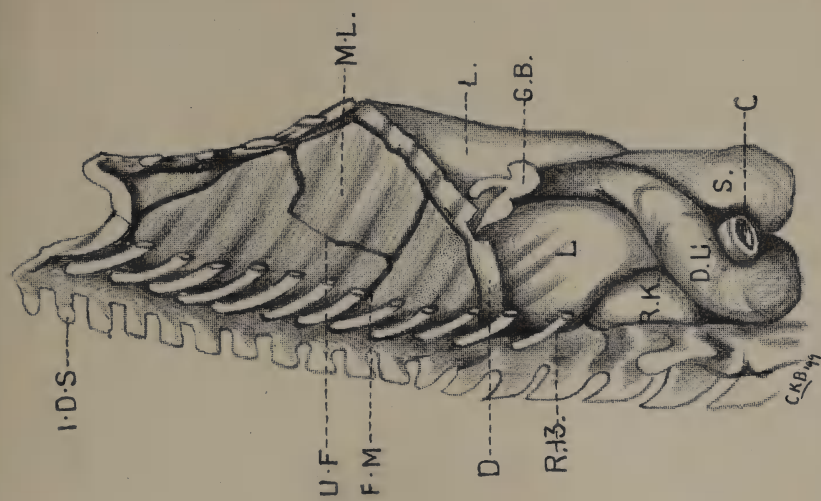


(D)

Lungs and Heart of Lemur.



(A)



(B)

Side View of the Thoracic and Abdominal Viscera in the Lemur.

EXPLANATION OF THE PLATES.

PLATE I.

This shows the line of the reflection of the subcostal pleura diagrammatically in different groups of animals. The dotted lines indicate the reflection of the pleura.

Nos. 1 and 3 are reproduced from Tanja's work, already alluded to in this paper.

The remaining figures of *Felis*, *Macacus*, *Cynocephalus* and *Simia*, are diagrammatic representations of the line of the reflection of the subcostal pleura as observed in these animals which were dissected by the author himself.

PLATE II.

These illustrations are from photographs taken directly from the dissections. Save making the transparent pleural membrane opaque by painting it with Chinese white, and putting a black line over the costo-chondral articulations, no retouchings or modifications of any kind have been introduced.

Each figure shows the greater part of the subcostal pleura, and the line along which it is reflected on to the diaphragm.

A. Shows the pleura from the right side.

B. „ from the front.

C. „ from the left side.

C. 7. = Seventh cervical spine.

D. 1. = First dorsal spine.

D. 13. = Thirteenth dorsal spine.

N.B.—The thirteenth rib is not seen. It is placed far back, being very short.

PLATE III.

These illustrations are also reproduced from photographs directly taken from the actual specimens.

A.—This shows the sculpturing or depressed areas on the inner surfaces of the lungs :—

LEFT LUNG.

es. = groove for gullet.

aor. = aortic groove.

x. = common groove for aorta and œsophagus.

p. b. = posterior border.

h. v. = depression for ventricles of heart covered by pericardium.

d' f' = depressions for fat.

b' l' = base of lung formed by lower lobe.

b. u. = base of lung formed by upper lobe.

a. b. = anterior border.

RIGHT LUNG.

tr. = groove for trachea.

p. b. = posterior border.

i. c. = groove for inferior cava on "lobus impar."

b. l. = base of lung formed by lower lobe.

b. m. = base of lung formed by middle lobe.

a. = depression for right auricle of heart covered by pericardium.

f. = depression for fatty tissue containing thymic elements.

d. = another depression for fatty tissue.

a. b. = anterior border.

The constituents of the pulmonary root are easily made out, and need no further description here.

B.—Outer surfaces of the right lung (R. L.) and of the left lung (L. L.), showing the rib depressions. Note also the difference in the shape of the two lungs, and the position and direction of the fissures.

C.—View of the heart and its vessels from the dorsal aspect.

- s. c.* = precaval vein.
- i. c.* = post-caval vein.
- p. v.* = pulmonary veins.
- p. a.* = pulmonary arteries.
- a.* = aorta.
- l. s.* = left subclavian.
- l. c.* = left common carotid.
- r. c.* = right common carotid.
- r. s.* = right subclavian.
- i.* = innominate artery.

D.—The heart and its vessels from the ventral aspect. Note the large right auricle (*r. a.*), with its appendix (*ap.*); also the conus arteriosus (*c. a.*) below the aortic arch (*a.*). The rest of the structures are lettered as in *C.* The long superior cava (precaval vein) and the innominate and left subclavian arteries are well seen in these two figures.

PLATE IV.

Two drawings of the thoracic and abdominal viscera, as seen in profile. They illustrate the topography of the organs and their relations to the vertebral column:—

<i>A. (LEFT SIDE).</i>		<i>B. (RIGHT SIDE).</i>	
	1. <i>d. s.</i> = 1st dorsal spine.		1. <i>d. s.</i> = 1st dorsal spine.
	13. <i>d. s.</i> = 13th dorsal spine.		<i>r. 13</i> = rib 13.
	<i>r. 13</i> = rib 13.		
<i>Lung</i>	{ <i>c. f.</i> = cardiac fissure.	<i>Lung</i>	{ <i>f. m.</i> = main fissure.
	{ <i>f. m.</i> = main fissure.		{ <i>u. f.</i> = upper fissure.
	<i>d.</i> = diaphragm.		<i>d.</i> = diaphragm.
	<i>h.</i> = heart and pericardium.		<i>l.</i> = liver.
	<i>l.</i> = liver.		<i>g. b.</i> = gall bladder.
	<i>s.</i> = stomach.		<i>r. k.</i> = right kidney.
	<i>du.</i> = duodenum.		<i>du.</i> = duodenum.
	<i>sp.</i> = spleen.		<i>s.</i> = stomach.
	<i>l. k.</i> = left kidney.		<i>c.</i> = colon.
	<i>c.</i> = colon.		<i>m. l.</i> = middle lobe of lung.
	<i>is.</i> = isthmus of the upper lobe of the lung.		

The position of the fissures of the lungs, also the impressions for the ribs, should be noted.

THE PRESIDENT remarked that the methods of classifying vertebrate types came to little more than dentition, and some few features about bones, with most meagre facts about viscera. Regarding lemurs, which are so doubtful in position, it was very useful to show exactly the relations of their organs, and Dr. Patten's work was very carefully done in this respect.

PROFESSOR D. J. CUNNINGHAM said that Dr. Patten's work was most carefully done. It was another evidence of the value of formalin. It was very unsafe to found any classification on one or two characters. The animal must be investigated from top to toe, and recently, even the muscles which had been thrown into disregard for a long time, are being utilised for this purpose. He was doubtful if the study of formalin forms would help much in this particular direction, but he thought that the work would probably help them to get some idea of the forces which were at work in determining the form of solid organs. This might be done by the study of the comparative anatomy, but still more by the study of the foetus. Some organs grew out in the direction of least resistance, and their shape was thus determined. Other organs, such as the liver, offered more difficulty in the way of coming to a conclusion.

PROFESSOR FRASER did not wholly agree with Professor Cunningham's remarks about the manner in which organs were shaped. Some organs had plenty of room at their disposal, but yet took a very definite shape, and he could not see how mechanical causes came into play in every case.

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